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Perceived Value: Definitions, Concepts and Measures for Sport and Fitness Industry

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Abstract

In this study, it is aimed to provide a framework about approaches to the measurement of perceived value in sports and fitness studies. In order to achieve this goal, the definition, conceptual approaches, dimensions and measurement approaches of perceived value were examined. In the context of sports in general and fitness in particular, its relationship with components such as service quality, satisfaction, and behavioral attitudes, which are examined in relation to value, was discussed. In related studies, the concept of perceived value has been measured in a uni-dimensional and multi-dimensional way. Perceived value may differ according to product, service, and consumer characteristics. Since sports consumers are a group of people whose consumption characteristics differ as active and passive participants (spectators and fans), the differentiation of the measurement of perceived value is an acknowledged situation. Document review was used as a research method in this study. It was attempted with this study to provide a deeper understanding of the nature of perceived value for researchers in the field of sports and fitness. In addition, recommendations for future studies in the contexts of sports and fitness were presented.

Key Words: Value, Perceived value, Sport, Fitness

Algılanan Değer: Spor ve Fitness Endüstrisi için Tanımlar, Kavramlar ve Ölçümler

Özet

Bu çalışmada spor ve fitnes araştırmalarında algılanan değerin ölçümüne yönelik yaklaşımlar konusunda bir çerçeve sunmak amaçlanmıştır. Bu amacı gerçekleştirebilmek için algılanan değer tanımı, kavramsal yaklaşımlar, algılanan değerin boyutları ve ölçüm yaklaşımları incelenmiştir. Genel olarak spor daha özelde ise fitness bağlamında değer ile bağlantılı incelenen hizmet kalitesi, memnuniyet, davranışsal tutum gibi bileşenlerle ilişkisi tartışılmıştır. İlgili araştırmalara göre algılanan değer kavramı tek boyutlu ve çok boyutlu bir şekilde ölçülmüştür. Algılanan değer ürün, hizmet ve tüketici özelliklerine göre farklılaşabilmektedir. Spor tüketicileri aktif katılımcı ve pasif katılımcı (izleyici ve taraftar) olarak tüketim özellikleri farklılaşan bir grup olduğundan, algılanan değerin ölçümünün farklılaşması kabul edilen bir durumdur. Bu araştırmada yöntem olarak "doküman incelemesi" tercih edilmiştir. Bu çalışma ile spor ve fitness alanındaki araştırmacılara algılanan değerin, doğası hakkında daha derin bir anlayış sunulmaya çalışılmıştır. Ayrıca, spor ve fitness bağlamında gelecekteki araştırmalar için öneriler sunulmuştur.

Anahtar kelimeler: Değer, Algılanan değer, Spor, Fitness

INTRODUCTION

Marketing has today become a discipline that explores which driving forces create value for customers. Due to the prevailing way of thinking, the studies on which variable is the precursor of the value were focused on (12). However, value is a phenomenon that has new perspectives and its research must be sophisticated (7,54, 64).

Value has been seen as a key element of customer satisfaction, which is one of the most important factors in achieving competitive advantage (65). Despite this, it is a concept that is being discussed in the service literature (12). One of these discussions is related to the concept of value. The consensus on the concept of perceived value is very insufficient (12). Another reason for the occurence of these discussions is the tendency to evaluate perceived value as a uni-dimensional structure. However, perceived value is related to a multi-dimensional structure that includes elements such as the expected utilities (results, emotions) and the sacrifices to be endured (price, process) during the purchase and use of goods and services (59). The third reason is the misuse of concepts such as perceived value and customer satisfaction interchangeably (54). While the perceived value is a cognitive evaluation that occurs before and after the purchase, customer satisfaction is an affective result that appears after the purchase, beyond being cognitive, and may be effective in guiding the customer's future purchasing attitudes and tendencies (22). Therefore, it can be said that using the two concepts interchangeably is not a correct approach.

At the same time, it is emphasized in the literature that perceived value has two aspects as behavioral perspective and utilitarian perspective (29). Perceived value has shed light on other research, in the context of utilities and sacrifices (67) and the multi-dimensional (57) ends-means model (24) approaches. In what context should the perceived value, which varies depending on many factors (from customer to customer), be considered? All these findings in the related literature reveal the unclarity of the concept of value.

The concept of perceived value has been the focus of research in the service sector since the early 1990s. It attracts considerable attention within the scope of research in the context of sports and fitness. The most important reason for this is that perceived value is accepted as a reliable indicator of customer satisfaction and buying behavior of the consumer or behavioral intentions in many studies (32). In a study in which many theoretical models were developed and tested in the context of sports and fitness, perceived value was evaluated as an important indicator that has an impact on post-consumption attitudes (18,61). However, perceived value is seen as the key to being successful in maintaining competition (35). For these reasons, it emerges as a variable that is desired to be measured in studies. However, as in other contexts, it is remarkable that there are uncertainties and no consensus regarding the measurement of the concept of value in sports literature.

Sports products are characteristically classified under two different headings: tangible products and service products (14). It is possible to say that there is a wide range of products in both categories. Specific to the sports industry, one of the striking points in terms of service is that sports consumers can be active or passive participants while consuming these products (2). Meanwhile, in the passive participant group, there is a mass like fans whose value perceptions differ from other consumers (41). Since the perceived value has a characteristic that it can vary according to the type of product or service and the characteristics of the consumers (43,67), it comes to mind that differentiation may be present in sports consumers. At this point, the perceived value can have a multi-dimensional feature in the context of sports and fitness.

As a result, it can be difficult to determine what kind of value can be presented or offered to each type of consumer. Therefore, this study provides a framework for how value is and should be used in the context of sports and fitness research. Based on the results of the research, it is hoped that constructive directions will be provided for sports in general and fitness researches in general, while a better understanding of the importance of perceived value for sports literature is expected to be encouraged.

METHOD

Document review was used as a research method in this study. The document review includes an analysis of written material about the phenomenon which was aimed to research. The documents about perceived value were examined in this research and made an effort to form an understanding about how the perceived value

should be used or was used in sports researches. The perceived value was interpreted in sports and fitness research context. When the previous studies conducted in sports, in general, and fitness, in particular, were examined the following findings were obtained;

RESULTS

The Concept of Perceived Value

When the related body of literature is examined, value is generally explored in an nonspecific way (54). In terms of value, the concepts of value (singular) and values (plural) should be distinguished first (1). Value is defined by the Turkish Language Association as "the abstract measure that helps to determine the importance of something, the equivalence that something is worth". Values are determinants of any social behavior including attitude, ideology, beliefs, and justifications.

Some properties of values are mentioned. These are values are beliefs, values refer to desirable goals, values transcend specific actions and situations, values serve as standards or criteria, values are ordered by importance (56). With these features, values play an important role in influencing people's attitudes and behaviors, determining and shaping attitudes and behaviors (63). Based on this, it can be stated that the concept of values is different from the concept of value.

In the marketing literature, value is evaluated by the ratio of the perceived utility to the perceived sacrifice as a result of the consumption of a product or service by the consumer (48). Zeithaml (1988) defines perceived value as the general assessment of a product's utility in relation to what the consumer pays for and receives for a product (67). It draws attention as being the most important structure in understanding consumer behavior, especially in the service industry (31).

While some researchers in the literature evaluate perceived value from a single dimension, others claim that it is more complex (13) and state that it is multi-dimensional (8,30,60). This is the second reason for the unclarity about perceived value. According to Sheth et al. (1991), perceived value consists of social, emotional, functional, epistemic, and conditional value dimensions (57). According to Sweeney and Soutar (2001), it is a three-dimensional structure with functional, social, and emotional dimensions (60). According to Grönroos (1997), it is two-dimensional, cognitive, and emotional (30). Boksberger & Melsen (2011) investigated perceived value in terms of societal, transaction-specific, and end-state values (12). Details of the value investigated in three contexts are presented in Table 1.

Table 1. "The generel nature of perceived value" (12).

Societal values	Transaction- specific values	End-state value
Service industry	Service excellence	Customer lifetime value
Social corporate responsibility	Service recovery	Service profit chain
Rules	Value creation	Relationship marketing
Business ethics	Pricing	
Individual customer		
Attitude	Service Quality	Quality of life Wellbeing
Desired values	Customer Satisfaction	
Comparison standards	Consumption Values	
Expectation	Benefits	
	Sacrifices	

It is the transaction-specific personal value that will be evaluated here. Because transaction-specific personal value is the value that the customer has for the product and service in his mind. Here, there is a customer's general assessment of the utilities of a product based on the perception of what is received and given in return. But the main problem is related to what elements the value consists of. The number of components that form the value concept (product utility, image utility, services utility) is too high. In addition, perceived value is related to concepts such as perceived price, monetary value, and psychological cost. At the same time, stimulants such as the characteristics of the product, interest for the product, personal needs, motives, expectations, personality, social standing and personal reaction factor can also affect the value (5). Thus, we can classify perceived value with the approaches of utilitarian perspective based on the perception of what is given and received in return for a product, and behavioral perspective that evaluate and describe the product with its qualities, performance

and results. Regarding this, it is possible to conduct correct researches only by knowing the utilitarian and behavioral perspective of the perceived value.

Perceived Value According to the Uni-dimensional Perspective

Human, by nature, adopts decisions and choices that will maximize utilities and minimize internal costs (3). The Expected Utility Theory has been widely used in decision making under uncertain conditions, making rational choices, and explaining economic behavior (62). The utility of a service is measured according to this theory. The expected utility theory states that price is a service value and that consumers spend their income to maximize the "value" they receive from services (49). The utilitarian perspective approach to perceived value focuses on the general assessment of consumers as a result of comparing the concessions (prices) and utilities (results) for products or services (67). The utilitarian perspective on perceived value is conceptualized as an exchange between the utility obtained from the use of a service and the difficulties in getting and using the service (12).

However, evaluating the perceived value over the "price" causes the complexity and multi-dimensional aspects of the price to be overlooked. For example, the perception of a product's retail (real) and reference (caused by external sources, previous experiences) price for consumers differ from each other (6). At the same time, even if they have a high level of satisfaction with the product or service, it is possible for consumers to perceive the product as having low value, as the costs of obtaining this product or service are perceived as high. On the other hand, if moderately satisfied consumers think that they will benefit more compared to the price they pay, they may think that the product or service has a good value (55).

Research in the context of sports shows that the role of price is much more complex than a simple indicator of purchase cost. Calabuig et al. (2014) found a negative relationship between price increase and perceived value (15). Chi and Kilduff (2011) found a positive relationship between price and consumer perceived value in their study (17). In addition, alternative service models, as Chang and Wildt (1994) did, tested real and reference price as predictors of perceived price. They found a positive relationship between the real price and the perceived price, and a negative relationship between the reference price and the perceived price (16). These studies reveal the unclarity of the relationship between price and perceived value. The reason behind this unclarity is that the price in sports services is based on both objective and external characteristics and the individual perception for the price of the consumer (36). Therefore, these details need to be considered if perceived value is to be evaluated in context of price. Defining perceived value according to price is an important but insufficient conceptualization. Because the perceived value is a structure that is too broad which can not be evaluated only by the exchange between utility and price (47).

Perceived Value According to the Multi-dimensional Perspective

The behavioral perspective on perceived value takes the structure more comprehensively and tries to explain it in more depth by going beyond utilities and sacrifices (12, 54). The behavioral perspective on perceived value is based on the social exchange theory. Social change theory is a sociological and psychological theory that applies a cost-benefit analysis to identify risks and utilities, examining social behavior within the interaction of two sides (21). While Economic Change Theory minds external utilities, Social Change Theory minds internal utilities (11). According to the theory, the customer's sacrifices include monetary payments and non-monetary sacrifices such as spending time, making effort and stress experienced by consumers (37).

Mutual exchange processes and social interaction lie at the root of the behavioral definition of perceived value (46). As in the value definition of Zeithaml (1988), many factors such as product qualities, performance characteristics and results are mentioned (67). These are listed as: Value is low price, value is everything that is intended to be in a product, value is the quality received in return of the price paid, and value is everything that is obtained in return for what is valued. In this context, perceived value is “the preference and evaluation perceived by the customer about the qualities, performance and results of this product as a result of its use, which facilitates (or prevents) the customer from achieving its goals in its use (12). The behavioral perspective on perceived value mentioned that value appears at different stages of the purchasing and / or consumption process, such as the moment of purchase, the moment of use, and finally after use (Sánchez et al., 2006). According to the behavioral perspective, value is also related to

the facts that occur throughout the process. Monroe and Chapman (1987), who formulated perceived value, described this concept as "Perceived Value=Perceived Utilities/Perceived Sacrifice" in a proportional sense (47). All these definitions are based on the view that pre-performance expectations about value have an effect on consumers' evaluation of service after performance.

The first studies related to behavioral perspective on perceived value were presented by Sheth et al. (1991). Sheth et al. (1991) proposed a theory of consumption value to analyze the consumer's choice to buy or not buy a product, to choose between two products, and to choose brand (57). This theory can be considered as one of the early theories about what elements constitute the behavioral perspective about perceived value. Sheth et al. (1991) saw the value as a five-dimensional structure. These dimensions are Functional Value, Social Value, Emotional Value, Epistemic Value. These values act independently from each other based on the product and service (66). These dimensions and their descriptions are as follows:

Functional value: It is a perceived utility by having product qualities (physical attributes) that provide functional utilities to consumers.

Social value: It is the perceived utility by associating the product and the groups with a different expression, which is related to the acceptance of individuals by other members of the society and not to feel disappointed in their social environment.

Emotional value: It is the perceived utility obtained from the capacity of the service or the product to evoke certain emotions and emotional states. It is evaluated in terms of its relations with emotions.

Epistemic value: It is the perceived utility obtained from the capacity of the product or the service to meet the desired value, to provide innovation, to satisfy knowledge and desire and to arouse curiosity.

Conditional value: It is the perceived utility achieved through the presence of primary physical or social possibilities in a certain situation.

In addition, Sánchez et al. (2006) dealt with perceived value as a dynamic variable that includes experiences before and during the purchase, and before and after the use, and developed the GLOVAL scale to measure the perceived value of a holiday package as a tourism product. The GLOVAL scale is an omnibus and multi-dimensional (functional, emotional, and social value) measurement tool (53). Sweeney and Soutar (2001) also aimed to develop the PERVAL scale concerning perceived value in their study. In the study, four different dimensions were obtained: Emotional value, social value, functional value (quality and performance) and functional value (price and monetary worth) (60).

Lastly, one of the researchers examining perceived value in behavioral context is Holbrook. Holbrook (1994) defined perceived value as “interactive relative preference experience”. Thus, he proposed a perceived value structure that has some common points with the abovementioned research approaches (33).

Table 2. Holbrook’s typpology of value in the consumption experience

		Extrinsic	**Intrinsic**
Self Oriented	Active	Efficıency (Convenience)	Play (Fun)
	Reactive	Excellence (Qualty)	Aesthetıcs (Beauty)
Other Oriented	Active	Status (success, İmpression, Management)	
	Reactive	Esteem (Repulation, Materialism, Possesions)	Spırıtualıty (Faity, Ecstasy, Sacredness)

Holbrook (1994) suggested that the perceived value construct consisted of some dimensions. These are efficiency (output/input ratio or convenience), excellence (quality), politics (success), esteem (reputation), play (fun), aesthetics (beauty), morality (virtue), and spirituality (faith or ecstasy). Some researchers considered this proposition of Holbrook (1994), who evaluated the behavioral perspective of perceived value in eight dimensions, as the most comprehensive explanation (54).

When the relevant literature is examined, it is seen that the studies measuring the perceived value in a multi-dimensional way defend the view that each quality that constitutes value is a different factor. In other words, an element of value, i.e. performance, may be valuable for one customer group (for example, a fan) but not for another. The results of the research also confirm this statement. There are studies in which a significant effect of one dimension of the value was determined, while no significant effect was detected in a different dimension. This makes it important to identify values that are important to different customer groups about them. For example, Kunkel et al. (2017) examined the effect of dimensions of perceived value on satisfaction and commintment. While the researchers determined the positive effect of functional value, one of the perceived value dimensions, on satisfaction, they could not detect any relationship on other dimensions (41). According to the results of this research, the dimensions of the perceived value give different results in the preliminary variable. At the same time, the result obtained in this study emphasizes that the perceived value in the context of sports can be measured with a multiple structure.

Sweeney and Soutar (2001) determined the sub-dimensions of the consumer perceived value scale as quality, emotional, price, social (60). This scale was developed as an omnibus scale that can be used to evaluate consumers' perceptions about the value of branded tangible products. Chi and Kilduf (2011) developed the customer perceived value (CPV) scale in the sportswear consumer sample (17). The sub-dimensions of the scale were determined as price, social, emotional, and quality. When these scale dimensions are assessed, it is seen that the value sub-dimensions of sports fans and sportswear consumers differ from each other. In their research on licensed sports products, Lee et al. (2011) examined the relationships between Material Values Scale (MVS) (44, 51), PRS, and PERVAL. This research supports that many factors in perceived value may be determinant within the scope of sports product (tangible or intangible).

As a result, the behavioral perspective about perceived value considers value as a multi-dimensional structure, not as a comparison of what it gives (price) and what it gets (results), as in the utilitarian perspective. For example, it does not see the sacrifices made by the customer as just a monetary cost. Its process includes psychological, energy and time costs. It sees the total utility of the customer not only as a result. It also includes emotions in the process, that is, in the total utility (54). Thus, it should be kept in mind that the behavioral perspective of perceived value has a multi-dimensional feature. In studies to be conducted considering this feature in the context of sports, it is thought that examining the perception of value (33,67), which expresses a personal situation that varies from consumer to consumer (for example, fitness member and fans), with more than one dimension, may provide more general interpretations. Moreover, the fact that there is an opinion in the literature that defends the necessity of measuring the perceived value in the context of sports (4) supports this idea.

Operational Sense of Perceived Value in Sports and Fitness Studies

When the relevant body of literature is examined, it is seen that value is a concept that has been discussed many times in research in the context of sports and fitness (27). In these studies, value was measured as uni-dimensional (65) and multi-dimensional (41). The uni-dimensional approach considers value as a cognitive exchange between perceived quality and perceived costs, and focuses on the functional side of perceived value, that is, consumption decision based on the price of the service (54). In the multi-dimensional approach, perceived value is evaluated in many ways (40, 41).

In studies evaluating perceived value with a single dimension (25), generally perceived value positively affected the variable to which it was preceded (19, 34, 38, 52, 58). However, in some studies in which theoretical models were tested, perceived value was seen as the structure that is affected by service quality (25), and affects satisfaction. It has also been associated with different precursor variables. For example, customer citizenship behavior was considered as the predecessor of perceived value in the research Chiu et al. (2017) examined the relationship between customer citizenship behavior and perceived value (18). A summary of the studies that measure the perceived value in the context of sports and fitness in one dimension, in addition to these studies, is presented in Table 3.

Table 3. Studied interdependencies among perceived value in fitness

Author(s) and year	Consept Dependent and Independent variable	Study design	Research context	Research streams on perceived value
(25)	(PQ SC)/ PV / S/ FI	-Survey -Structural equation modeling	Low-cost fitness centers	One-dimensional
(65)	SQ: (S/P/LR/PF/WF) /PV / CS/ RI:	-Survey -Structural equation modeling	Fitness centers	One-dimensional
(18)	CCV / PV /S / RI	-Survey -Structural equation modeling	Fitness centers	One-dimensional
(26)	PQ(F/E/P) / PV /S /FI	-Survey -Structural equation modeling	fitness centers	One-dimensional
(28)	OQ(F/E/P) S/PV/FI	-Survey -Structural equation modeling	Fitness centers	One-dimensional
(10)	SE /PV/BI	-Survey -Structural equation modeling	A group fitness class	One-dimensional
(20)	İQ/ SQ/ PV/S /BI	-Survey -Structural equation modeling	Health and fitness centres	One-dimensional
(23)	SQ /S /PV / FI (AP/R/L)	-Survey -Structural equation modeling	Women fitness centers	One-dimensional
(45)	SQ/S/PV	-Survey - Regression	Women fitness centers	One-dimensional

PQ: Perceived quality, SC: Service Convenience, S: Satisfaction, FI: Future Intenions, SQ: Service Quality, S:Staff, P:program, LR: Locker room, PF: Phsical Facility, WF: Workout facility, PV: Perceived value, CS: Costomer Satisfaction, CV: Costomer value, CVC: Costomer value co –creation, CCV: Customer citizenship behavior, RI: Repurchase intention, F: Facilities, E: Employees, SE: Service experience İQ: İnteractive quality AP: Adaptation to price R: Responsıveness C: Commitment

There are not only studies that measure perceived value in the context of sports and fitness in one dimension but also multi-dimensional ones. For example, Kungel et al. (2017) developed the Perceived Sport Game Value Scale in the context of sports, based on the structure revealed by Sheth et al. (1991). Accordingly, the perceived value was evaluated in five sub-dimensions as in Table 4. The perceived value in the research was measured according to the utility (economic, social, and relational) it brings, and the sacrifice made (such as price, time, effort, risk). Considering the findings of this study, it was seen that there was a high level of relationship between functional value and satisfaction, but not between economic, social, emotional, and epistemic values. Zauner et al. (2015)'s attitude that says "values differ by product and service" was confirmed by Kunkel et al. (2017) in the context of sports. In addition, the research of Kunkel et al. (2017), which evaluates value in sports in a multi-dimensional way, shed light on sports researches that evaluate value in a multi-dimensional way (41,57, 66).

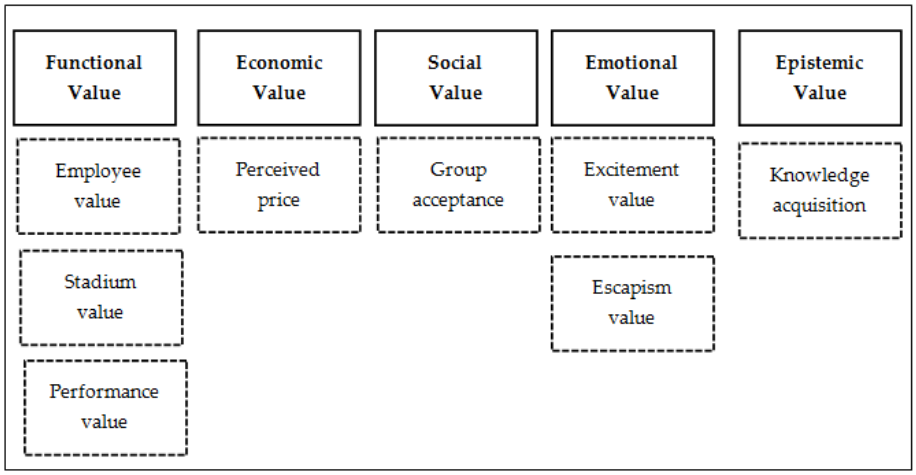

Figure 4. Consumer' perceived value of sport games (CPVSG)

There are other studies that measure the perceived value in the context of sports in a multi-dimensional way. Kim et al. (2019) examined the relationship between other customers' passion and economic, social, emotional, epistemic value (40). Baek et al. (2020) found a meaningful relationship between brand globalness and functional, economic, social, emotional, epistemic value, and a meaningless relationship between altruistic value and customer loyalty, in their study on golf club members (10). When all these research results are evaluated, it is seen that different results are obtained in studies that measure the value in a multi-dimensional way. This indicates that each dimension of value should be evaluated independently (66). In other words, in sports research, there are researchers who argue that value formed by of a multi-dimensional structure consisting of the perceptions of price, quality, quantity, utilities and sacrifice. Regarding this, the multi-dimensional research of value may allow a better understanding of this multi-dimensional structure.

Although value is considered as a uni-dimensional structure in sports and fitness studies, research in the context of marketing and tourism outside of sports also provides important arguments that value is multi-dimensional (42, 50). Value, when it is evaluated in a uni-dimensional way, generally positively affected the variable to which it was preceded. In the context of sports, value has a complex structure. It may differ according to the type of sports consumer (spectator, fan and active participant) or consumption habits. Therefore, examining perceived value with a multi-dimensional approach in different research areas within the context of sports (spectator or participant) allow a better understanding for the value structure. In other words, in the context of sports, value should be examined as a multi-dimensional structure. The first reason for this is that the number of components that make up the concept of value is too great, while the second is the effects of personal psychological factors. Sports consumer may be affected differently from the concepts of perceived utilities, perceived price, monetary value, psychological cost, and behavioral cost. For this reason, components that make the measurement of value difficult should be considered individually in the context of sports, as well.

Conclusion and Recommendations

In this study, the definition, conceptual structure, and measurement methods of the perceived value related to sports and fitness were examined, and it was tried to contribute to the body of literature on sports. Considering the review in the literature, it is understood that perceived value is handled with a utilitarian and behavioral perspective (Boksberger, & Melsen, 2011). It was also observed that studies examine the nature of consumer value in a uni-dimensional (price-based studies, means-ends theory) and multi-dimensional way (Utilitarian and hedonic value) (Sánchez-Fernández, & Iniesta-Bonillo, 2007).

Value scales developed in sports literature are based on the Perceived Sport Game Value scale developed by Kunkel et al. (2017) and the structure developed by Sheth et al. (1991). The sub-dimensions of the customer perceived value (CPV) scale developed by Chi and Kilduf (2011) differ from each other (17, 41). This leads to the fact in the context of sports that fans, consumers of tangible products or fitness members actively participating in sports are affected by different value elements. In other words, there may be differences between what sports consumers value in fact. Also, when the sports literature is examined, it is revealed that the scope of the traditional conceptualization of value structure focuses on intangible products and includes general extensions of quality scales.

When the sports literature is examined, it is seen that the results of the research measuring the perceived value in a multi-dimensional way differ from each other. Firstly, the findings show that a multi-dimensional scale explains the perceived value of services better both statistically and qualitatively than a single “value for money” scale (40, 41). These findings show that in sports, a multi-dimensional scale of value explains the perceived value of services better both statistically and qualitatively than a uni-dimensional scale. For this reason, when examining the concept of value in sports research, it should not be measured as a uni-dimensional structure. Value is not a simple exchange transaction between quality and price (54).

Sports consumers constitute a group of people with different characteristics. The motives of consumers who participate in sports in an active and spectator sense are different from each other (39). Therefore, perceived value may also have consumer specific (active, passive) determinants. For example,

for a fitness member, price is seen as a factor that can affect perceived value more, while the same factor can have different effects on perceiving value for a fan. Thus, future studies may identify the multi-dimensionality of value in different sectors of sport (fitness, football) and different types of services. In this context, revealing what sports consumers (tangible product or intangible product) care about in the context of future research will help to better understand the concept of value in sports.

Executive summary and implications for managers and executives

When the sports and fitness literature is examined, it cannot be said that there is a proper consensus on the definition and use of this concept, although there are many studies related to perceived value. Therefore, the measurement of the concept of perceived value needs to be understood more deeply. Thus, it is aimed to contribute to filling the gap in the field of sports in this study. Correctly drawing the framework of value researches to be carried out in the sports and fitness industry depends on a better understanding of the value element that is important for research, a better understanding of the multi-dimensional structure of perceived value consisting of interrelated qualities, and determination of whether the sport changes in different consumer groups (active, passive). At the same time, the review of studies that comprehensively address the concept of perceived value in the context of service businesses (12, 54) will provide a comprehensive overview to stimulate a better understanding of the concept of perceived value.

REFERENCES.

1. Agle BR, Caldwell CB. Understanding research on values in business: A level of analysis framework. Business & Society, 1999: 38(3), 326-387.
2. Akkaya Y. Spor Pazarlamasında Ürün Kavramının İncelenmesi, International Journal of Science Culture and Sport. 2016: 4(3), 821-829.
3. Aktan ÇC. Vergi psikolojisinin temelleri ve vergi ahlakı. Çimento Endüstrisi İşverenleri Sendikası Dergisi, 2012: 26 (1), 14 – 22
4. Aktaş İ, Akıllı M. Turkish adaptation of Consumers' Perceived Value of Sport Games Scale. Journal of Human Sciences, 2020: 17(4), 1123-1136.
5. Al-Sabbahy HZ, Ekinci Y, Riley M. An investigation of perceived value dimensions: Implications for hospitality research. Journal of Travel Research, 2004: 42(3), 226-234.
6. Amlani AM. Influence of perceived value on hearing aid adoption and re-adoption intent. Hearing Review Products, 2013: 20(3), 8-12.
7. Aulia SA, Sukati I, Sulaiman Z. A review: Customer perceived value and its Dimension. Asian Journal of Social Sciences and Management Studies, 2016: 3(2), 150-162.
8. Babin BJ, Darden WR, Griffin M. Work and/or fun: measuring hedonic andutilitarian shopping value. Journal of Consumer Research 1994: 20, 644–656.
9. Baek WY, Kim KA, Kim DH, Byon KK. The Impacts of the Perceived Golf Course Brand Globalness on Customer Loyalty through Multidimensional Perceived Values. Sustainability, 2020: 12(3), 978.
10. Baena-Arroyo MJ, Gálvez-Ruiz P, Sánchez-Oliver AJ, Bernal-García A. The relationship among service experience, perceived value and behavioural intentions of customers in a group fitness class. Revista de psicología del deporte, 2016: 25(1), 89-92.
11. Bock GW, Kim YG. Breaking the myths of rewards: An exploratory study of attitudes about knowledge sharing. Information Resources Management Journal (IRMJ), 2002: 15(2), 14-21.
12. Boksberger PE, Melsen L. Perceived value: a critical examination of definitions, concepts and measures for the service industry. Journal of Services Marketing, 2011: 23(3), 229-240.
13. Bolton RN, Drew JH. A multistage model of customers'assessments of service quality and value. Journal of Consumer Research, 1991: 17(4), 375–384.
14. Brooks CM. Sports Marketing Competitive Strategies for Sports. New Jersey: Prentice-Hall, 1994.
15. Calabuig F, Núñez-Pomar J, Prado-Gascó V, Añó V. Effect of price increases on future intentions of sport consumers. Journal of business research, Journal of Business Research, 2014: 67(5), 729-733.
16. Chang TZ, Wildt AR. Price, product information, and purchase intention: An empirical study. Journal of the Academy of Marketing science, 1994: 22(1), 16-27.
17. Chi T, Kilduff PP. Understanding consumer perceived value of casual sportswear: An empirical study. Journal of Retailing and Consumer Services, 2011: 18(5), 422-429.
18. Chiu W, Shin S, Lee HW. Value Co-Creation in Fitness Centers: The Role of Customer Citizenship Behavior on Perceived Value, Satisfaction, and Repurchase Intention. In Handbook of research on strategic alliances and value co-creation in the service industry, IGI Global. 2017.
19. Chiu W, Won D, Bae JS. Customer value co-creation behaviour in fitness centres: how does it influence customers' value, satisfaction, and repatronage intention? Managing Sport and Leisure, 2019: 24(1-3), 32-44.
20. Dhurup M. Employee interactive quality and perceived value effects on satisfaction and patronage intentions in commercial health and fitness centres in South Africa. African Journal for Physical Activity and Health Sciences (AJPHES), 2017: 23(2), 301-321.
21. Emerson RM. Social exchange theory. Annual review of sociology, 1976: 2(1), 335-362.
22. Eskiler E, Altunışık R. Algılanan değer ve müşteri memnuniyetinin satın alma eğilimleri üzerine etkisi. III. Rekreasyon Araştırmaları Kongresi, 2015: 483-493.
23. Fernández-Martínez A, Haro-González M, Nuviala R, Pérez-Ordás R, Nuviala A. Women and physical activity in fitness centres. Analysis of future intentions and their relationship with age. International Journal of Environmental Research and Public Health, 2020: 17(15), 2-15.
24. Flint DJ, Woodruff RB, Gardial SF. Exploring the phenomenon of customers' desired value change in a business-to-business context. Journal of Marketing, 2002: 66(4), 102-117.

25. García-Fernández J, Gálvez-Ruíz P, Fernández-Gavira J, Vélez-Colón L, Pitts B, Bernal-García A. The effects of service convenience and perceived quality on perceived value, satisfaction and loyalty in low-cost fitness centers. Sport Management Review, 2018a: 21(3), 250-262.
26. García-Fernández J, Gálvez-Ruíz P, Pitts BG, Vélez-Colón L, Bernal-García A. Consumer behaviour and sport services: an examination of fitness centre loyalty. International Journal of Sport Management and Marketing, 2018b: 18(1-2), 8-23.
27. García-Fernández J, Gálvez-Ruiz P, Sánchez-Oliver AJ, Fernández-Gavira J, Pitts BG, Grimaldi-Puyana M. An analysis of new social fitness activities: loyalty in female and male CrossFit users. Sport in Society, 2020; 23(2), 204-221.
28. García-Fernández J, Gálvez-Ruiz P, Vélez-Colon L, Ortega-Gutiérrez J, Fernández-Gavira J. Exploring fitness centre consumer loyalty: differences of non-profit and low-cost business models in Spain. Economic Research-Ekonomska İstraživanja, 2018c: 31(1), 1042-1058.
29. Grewal D, Monroe KB, Krishnan R. The effects of price-comparison advertising on buyers' perceptions of acquisition value, transaction value, and behavioral intentions. Journal of Marketing, 1998: 62(2), 46-59.
30. Grönroos C. Value-driven relational marketing: from products to resourcesand competencies. Journal of Marketing Management. 1997: 13 (5), 407–420.
31. Ha J, Jang SS. Perceived values, satisfaction, and behavioral intentions: The role of familiarity in Korean restaurants. International Journal of Hospitality Management, 2010: 29(1), 2-13.
32. Haro-González M, Pérez-Ordás R, Grao-Cruces A, Nuviala R, Nuviala A. Female users of unisex fitness centres and of fitness centres exclusive for women: Satisfaction. International Journal of Sports Marketing and Sponsorship. file:///C:/Users/Windows%2010/Downloads/IJSMS2018.pdf.2018.
33. Holbrook MB. The nature of customer value: an axiology of services in the consumption experience. Service quality: New directions in theory and practice, 1994: 21(1), 21-71.
34. Howat G, Assaker G. Outcome quality in participant sport and recreation service quality models: Empirical results from public aquatic centres in Australia. Sport Management Review, 2016: 19(5), 520-535.
35. Huber FA. Herrmann and RE. Morgan. Gaining competitive advantage through customer value oriented management. Journal of Consumer Marketing, 2001: 18(1), 41-53.
36. Jacoby J. Olson, JC. Consumer response to price: an attitudinal, information-processing perspective", in Wind, Y. and Greenberg, M.G. (Eds), Moving a Head with Attitude Research, American Marketing Association, Chicago, IL, 1997.
37. Jain P, Kumar A, 2015. Investigating the moderating role of switching cost in the relationship of eservice quality, perceived customer value, satisfaction and loyalty towards online travelagencies. International Journal in Management and Social Science, 3, 323-333.
38. Javadein SRS, Khanlari A, Estiri M. Customer loyalty in the sport services industry: the role of service quality, customer satisfaction, commitment and trust. Journal of Human Sciences, 2008; 5(2), 1-19.
39. Kilpatrick M, Hebert E, Bartholomew J. College students' motivation for physical activity: differentiating men's and women's motives for sport participation and exercise. Journal Of American College Health, 2005: 54(2), 87-94.
40. Kim K, Byon KK, Baek W. (2019). Customer-to-customer value co-creation and co-destruction in sporting events. The Service Industries Journal, 2019: 40(9-10), 633-655
41. Kunkel T, Doyle JP, Berlin A. Consumers' perceived value of sport team games—A multidimensional approach. Journal of Sport Management, 2017: 31(1), 80-95.
42. Lee CK, Yoon YS, Lee SK. Investigating the relationships among perceived value, satisfaction, and recommendations: The case of the Korean DMZ. Tourism management, 2007: 28(1), 204-214.
43. Lee D, Trail GT, Kwon HH, Anderson DF. Consumer values versus perceived product attributes: Relationships among items from the MVS, PRS, and PERVAL scales. Sport Management Review, 2011: 14(1), 89-101.
44. Lee YL, Pan LY, Hsu CH, Lee DC. Exploring the sustainability correlation of value Co-creation and customer loyalty-A case study of fitness clubs. Sustainability, 2019: 11(1), 97.
45. Lim J, Romsa B, Armentrout S. The Impact of Perceived Value, Satisfaction, Service Quality on Customer Loyalty in Women's Fitness Clubs–United States Sports Academy Sports Journal. https://openprairie.sdstate.edu/cgi/viewcontent.cgi?article=1139&context=hns_pubs, 2016.
46. Lin CH, Sher PJ, Shih HY. Past progress and future directions in conceptualizing customer perceived value. International Journal of Service Industry Management. 2005; 16(4), 318-336.
47. *Monroe KB, Chapman JD. Framing Effects on Buyers' Subjective Product Evaluations", in NA - Advances in Consumer Research Volume 14, eds. Melanie Wallendorf and Paul Anderson, Provo, UT : Association for Consumer Research, 1987: 193-197.*
48. Monroe, K. Pricing - Making Profitable Decisions, Boston: McGraw-Hill, 1991.
49. Neumann JV, Morgenstern, O. Theory of Games and Economic Behavior. Princeton, New Jersey. 2004.
50. Parasuraman A, Grewal D. The impact of technology on thequality–value–loyalty chain: A research agenda. Journal of theAcademy of Marketing Science, 2000: 28(1), 168–174
51. Richins ML, Dawson, S. A consumer values orientation for materialism and its measurement: Scale development and validation. Journal of consumer research, 1992: 19(3), 303-316.
52. Romiti A, Sarti D. Service Quality Experience and Customers' Behavioural Intentions in Active Sport Tourism. Modern Economy, 2016: 7(12), 1361-1384.
53. Sánchez J, Callarisa L, Rodríguez R, Moliner M. Perceived value of the purchase of a tourism product. Tourism Management, 2006: 27 (3) 394-409.
54. Sánchez-Fernández R, Iniesta-Bonillo MÁ. The concept of perceived value: a systematic review of the research. Marketing theory, 2007: 7(4), 427-451.
55. Sarıkaya N, Sütütemiz N, Konuk FA. Farklı Algılanan Değer Perspektifine Sahip Kişilerin Ayırt Edici Özelliklerinin İncelenmesi. Elektronik Sosyal Bilimler Dergisi, 2008: 7(23), 143-156.
56. Schwartz SH. An overview of the Schwartz theory of basic values. Online readings in Psychology and Culture, https://core.ac.uk/download/pdf/10687025.pdf, 2012: 2(1), 1-20.
57. Sheth JN, Newman BI, Gross BL. Why we buy what we buy: a theory ofconsumption values. Journal of Business Research, 1991: 22(2), 159–170.
58. Shonk DJ, Chelladurai P. Service quality, satisfaction, and intent to return in event sport tourism. Journal of Sport Management, 2008: 22(5), 587-602.
59. Sinha I, DeSarbo WS. An integrated approach toward the spatial modeling of perceived customer value. Journal of Marketing Research, 1998: 35(2), 236-249.

60. Sweeney JC, Soutar G. Consumer perceived value: the development ofmultiple item scale. Journal of Retailing, 2001: 77 (2), 203–220.
61. Şener HY, Behdioğlu S. Müşteri Sadakati Oluşturmada Müşterinin Algıladığı Değer, Memnuniyet ve Rakip İşletmeye Geçme Maliyeti: Bir Spor Merkezinde İstatiksel Uygulama. Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 2013: (30), 165-180.
62. Tomak, S. (2009) Girişimci Hesristikleri: Bir kavramsal çözümleme. Eskişehir Osmangazi Üniversitesi Sosyal Bilimler Dergisi: 10(2), 145 – 166.
63. Ulusoy K, Dilmaç B. Değerler eğitimi. Ankara: Ankara: Pegem Akademi. 2012.
64. Vargo SL, Lusch R F. Evolving to a new dominant logic for marketing. Journal of Marketing, 2004: 68(1), 1-17.
65. Yu HS, Zhang JJ, Kim DH, Chen KK., Henderson C, Min SD, Huang H. Service quality, perceived value, customer satisfaction, and behavioral intention among fitness center members aged 60 years and over. Social Behavior And Personality: An İnternational Journal, 2014: 42(5), 757-767.
66. Zauner A, Koller M, Hatak I. Customer perceived value—Conceptualization and avenues for future research. Cogent psychology, 2015: 2(1), 1-17.
67. Zeithaml, V. A. (1988). Consumer Perceptions of Price, Quality and Value: A Means-End Model and Synthesis of Evidence, Journal of Marketing, 1988: 52(3), 2–22

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Determining the Relationship between Speed and Branch-Specific Tests for Fencers in U 10-12 Age Categories

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Abstract

For success in fencing, it is necessary to make quick decisions and have the physical ability to apply this during the bout. This study aimed to determine the body composition of fencers competing in the U 10-12 age categories and to examine the relationship between the 30-m sprint test (30-m ST) and the 7-m repeat lunge ability test (7-m RLAT). Thirty-eight sabre fencers (female: 13 and male: 25) participated in the study. The anthropometric properties of the participants were determined, then the 30-m ST and the 7-m RLAT, a specific test for fencing, were performed. The differences between sexes were evaluated using the Mann-Whitney U test because the data were not distributed normally, and Spearman correlation analysis was performed to determine the relationship between performance tests. When the results of the study were examined, there was no significant difference between the sexes in the physical characteristics and performance tests of the athletes ($p>0.05$). However, when all fencers were evaluated together, a significant relationship was found between the 30-m ST and the 7-m RLAT ($rs(36)=0.526$, $p=0.001$). When the sexes were examined separately, a significant relationship was found between the 30-m ST and the 7-m RLAT only in the male group ($rs(23)=0.659$, $p<0.001$). This relationship suggests that 7-m RLAT may also give an idea for speed performance evaluation in this group.

Key words: Fencing, speed, branch-specific test

U 10-12 Yaş Kategorisinde Yarışan Eskrimcilerde Sürat ve Branşa Özgü Test Arasındaki İlişkinin Belirlenmesi

Özet

Eskrimde başarı için hızlı kararlar vermek ve maç sırasında bunu uygulayabilecek fiziksel yeterliliğe sahip olmak gereklidir. Bu çalışmanın amacı U 10-12 yaş kategorisinde yarışan eskrimcilerin vücut kompozisyonlarının belirlenmesi ve 30-m sürat testi ile 7-m tekrarlı hamle beceri testi arasındaki ilişkinin incelenmesidir. Çalışmaya 38 kılıççı (kız: 13 ve erkek: 25 katılmıştır. Katılımcıların antropometrik özellikleri belirlenmiş ve ardından 30-m sürat testi ve eskrim branşına yönelik spesifik bir test olan 7- m tekrarlı hamle testi uygulanmıştır. Verilerin normal dağılmaması sebebi ile cinsiyetler arasındaki farklar "Mann Whitney U" testi ile değerlendirilmiş, performans testleri arasındaki ilişkinin belirlenmesi için de Spearman Korelasyon analizi uygulanmıştır. Çalışmanın sonuçları incelendiğinde sporcuların fiziksel özellikleri ve performans testlerinde cinsiyetler arasında anlamlı bir farklılık yoktur ($p>0,05$). Diğer taraftan tüm eskrimciler birlikte değerlendirildiğinde 30-m sürat testi ile 7-m tekrarlı hamle beceri testi arasında anlamlı bir ilişki bulunmuştur ($rs(36)=0,526$, $p=0,001$). Cinsiyetler ayrı ayrı incelendiğinde ise sadece erkek grupta 30-m sürat testi ile 7-m tekrarlı hamle beceri testi arasında anlamlı bir ilişki bulunmuştur ($rs(23)=0,659$, $p<0,001$). Bu ilişki 7-m tekrarlı hamle beceri testinin söz konusu grupta sürat performansı değerlendirmesi için fikir verebileceğini düşündürdü.

Anahtar Kelimeler: Eskrim, sürat, branşa özgü test.

INTRODUCTION

In fencing, a tournament is completed with different rest intervals because group and direct elemination bouts are also played on the same day (18). As in all combat sports, the game progresses with mutual reactions in fencing (4). To score, fencers must be skilled in both attack and defense and be able to practice these moves repeatedly throughout the day. It should be emphasized that for a good fencing performance, the importance of quickly and skillfully applying the change of direction movements (10). The physical infrastructure necessary for the implementation of all these skills is possible by starting special trainings from a young age.

A fencer needs to be able to make their lunge (specific movement for attacking for fencing) quickly and recover from the lunge before the fencer is blocked by the opponent. To gain touches during the bout, every offensive and defensive move must be very fast. Reaction time is also an important property that affects the success in fencing (5) and it has been shown that this feature can be improved by agility training (15).

Body composition measurements are widely used in many studies examining different branches (2,3). For example, in a study investigating the relationships between body composition and speed in amateur football players, no statistically significant relationships were found between body mass index, lean body mass, and speed test results, but it was determined that speed test results were negatively affected as the body fat percentage and body fat mass of the participants increased (1). In terms of anthropometric properties, asymmetry is observed in the limbs as a result of the asymmetric guard position and it is therefore difficult to determine a meaningful relationship between any physical characteristics and performance. It was found that there was a difference of 10 to 12 cm2 between the cross-sectional areas of the dominant and non-dominant arms of fencers in different branches (11). Tsolakis, Bogdanis (12) found that somatotype components were not different between 10-year-old and over 20-year-old fencers. There are some anthropometric properties sought for success in certain sports. Long upper and lower extremities and an athletic structure are the mainly sougtht anthropometric features for fencers. However, fencers who do not have the expected anthropometric characteristics can make up for this deficiency with a high level of mental skills, speed, and technique. Although their height and body types are different, fencers can have a good chance of success when viewed in terms of the development of other performance parameters (12).

For success in fencing, besides the physical performance parameters, technical skills and tactical decision-making skills should also be developed. In addition, although the anaerobic energy system is key in terms of achieving touches, the aerobic energy system also plays an important role in the long-lasting total competition process (11). Competition performance is also affected by age, sex, sports experience, and the techniques and tactical practices used, depending on the opponent. Evaluating game requirements and organizing training programs in this direction are crucial in fencing, as in every branch, to improve competition performance.

The preference of branch-specific tests in measuring and evaluating physical performance may be more understandable for athletes and trainers. In addition, it can provide more accurate and practical information for the performance of the athlete. The aim of this study was to determine the body composition of fencers competing in the U 10-12 age category in Turkey and to examine the relationship between the 30-m sprint test (30-m ST) and the 7-m repeat lunge ability test (7-m RLAT).

METHOD

Thirty-eight licensed sabre fencers (25 male-13 female) competing in the U 10-12 age categories in Turkey participated voluntarily in this study. Approval was obtained from the Local Ethics Committee (Decision No.: 2019/18-33). The fencers were informed about the research and written consents of their parents and themselves were obtained. The fencers' height, body mass and body compositions were determined before performing the 30 m ST and 7-m RLAT. A tape measure was used for height measurements. Body mass and body composition analyses were performed using bioelectrical impedance analysis before breakfast using a body composition analyzer (InBody 270 Segmental Body Composition Analyzer, South Korea). Bioelectric impedance analysis was performed in accordance with the instructions specified by the manufacturer. The fencers performed a standard warm-up protocol before the

tests. This protocol was designed as a special warm-up including 10 minutes of fencing steps after 10 minutes of general warm-up.

30-m sprint test

Photocells (New Test Powertimer 300-Series Portable Mat & Photocells, Finland) were placed at the start and finish points of the fencers by creating a 30-m lane. The back feet of the participants touched the line 1 m behind the starting photocell. When they were ready, they started running. The photocell worked automatically when the participants entered, and when they came to the end zone, the photocell stops automatically. The test was peformed twice and best results were evaluated (sec).

7-m repeat lunge ability test

The 7-m RLAT is a branch-specific test and the validity of the test (ICC r = 0.83) is included in the literature (17). The test starts in the guard position, which constitutes the basic movement of fencing, and is carried out using foot movements, moving forward and backward and lunging at the finish line in each round. At the end of the test, each fencer covers a total distance of 46-m. Electronic photocells were located in the start and finish areas of the test (New Test Powertimer 300-Series Portable Mat & Photocells, Finland). Fencers started the test by advancing in the guard position and the system was activated automatically when they passed through the photocells. They continued, advancing 7-m in the guard position and executing the lunge at the finish line. Then they came back 4-m in the guard position, crossed the front leg from the line here, moved forward again 4-m in the guard position, and executed a lunge at the finish line. The fencers continued this process until five lunges were performed. After the fifth lunge, they stepped back to the starting line 7-m behind them in a guard position. During the test, all movements of the fencers were followed by an experienced trainer. The visual scheme of the test (16) is given in figure 1.

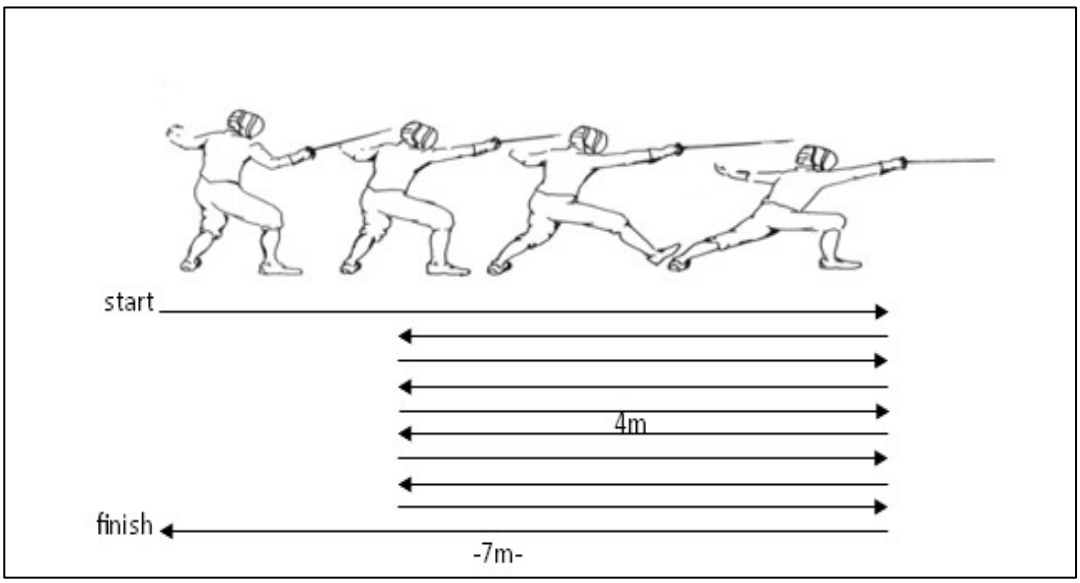

Figure 1. 7-m repeat lunge ability test

Data analysis

Data were evaluated using the SPSS statistical package program (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY). The normality tests (Kolmogorov-Smirnov/Shapiro-Wilk) of the data were performed and non-parametric tests were used in the analysis due to the lack of normal distribution. The differences between the sexes were evaluated using the Mann-Whitney U test, and Spearman correlation analysis was performed to determine the relationship between the performance tests. Data are presented as mean and standard deviation. The value of p is presented as $p<.05$.

RESULTS

The participants consisted of 38 (13 female - 25 male) licensed sabre fencers. Descriptive analyses of all participants are included in Table 1.

Table 1. Fencers' Body Composition, 30-m ST, and 7-m RLAT Results

	n: 38	X̄	SD
Age (year)		11.52	0.93
Height (cm)		150.46	7.86
Weight (kg)		42.52	8.25
Muscle mass (kg)		16.77	3.04
Fat mass (kg)		10.56	4.85
Fat rate (%)		24.10	7.17
Body mass index (kg/m²)		18.71	2.30
30-m ST (sec.)		5.45	0.39
7-m RLAT (sec.)		28.71	0.32

ST: Sprint test, RLAT: Repeat lunge ability test.

There was no statistically significant difference between the measured parameters in the comparison of the male and female groups. Descriptive analyses and comparisons between groups of two groups of 13 female - 25 male fencers are presented in Table 2.

Table 2. Comparison of Body Composition, 30-m ST and 7-m RLAT Results of Male and Female Fencers

	Male X̄±SD (n= 25)	Female X̄±SD (n= 13)	U	z	p
Age (year)	10.10±0.00	11.45±4.59	122.00	-1.246	0.213
Height (cm)	149.12±8.65	153.05±5.45	112.500	-1.539	0.124
Weight (kg)	41.20±8.64	45.06±7.05	119.000	-1.339	0.181
Muscle mass (kg)	16.29±3.40	17.69±2.00	114.000	-1.493	0.136
Fat mass (kg)	10.10±5.01	11.45±4.59	122.000	-1.246	0.213
Fat rate (%)	23.76±7.90	24.74±5.76	142.500	-0.616	0.538
Body mass index (kg/m²)	18.42±2.94	19.28±2.52	120.000	-1.308	0.191
30-m ST (sec.)	5.49±0.43	5.38±0.33	139.500	-0.708	0.479
7-m RLAT (sec.)	28.87±2.14	28.39±1.64	138.500	-0.739	0.460

ST: Sprint test, RLAT: Repeat lunge ability test.

When all participants were evaluated, there was a statistically significant, moderately positive correlation between 7-m RLAT and 30-m ST results according to Spearman correlation analysis. When the group consisting of 25 male fencers was evaluated separately, there was a statistically significant, strong positive correlation between the 7-m RLAT and the 30-m ST results. In the group of 13 female fencers, there was no statistically significant correlation between the 7-m RLAT and the 30-m ST results. All correlations are presented in Table 3.

Table 3. Correlations between 7-m RLAT and 30-m ST

		7-m RLAT	
		r	p
All Participant (n:38)	30-m ST	0.478	**0.002***
Male (n:25)		0.659	**0.001***
Female (n:13)		0.163	0.596

*p<.005, ST: Sprint test, RLAT: Repeat lunge ability test.

DISCUSSION

In this study, the body composition of fencers in the U 10-12 age category, consisting of the youngest athletes who can participate in fencing competitions, was determined and the relationship between 30-m ST and 7-m RLAT was investigated. There were no statistically significant differences between the body composition parameters of the female and male sabre fencers, and body mass indexes were found within normal limits for this age group. The 30-m ST and 7-m RLAT results were also not significantly different between the males and females.

The lack of significant differences between body composition parameters of the male and female fencers can be explained by the fact that the participants were in their last periods of childhood. In this period, it is an expected situation not to encounter significant developmental differences between the sexes, as may occur during adolescence. Similar to our findings, it has been shown in the literature that male and female runners aged 10-13 years have similar physical characteristics (7). On the other hand, in a group of fencers with a mean age above 13, it was observed that there were significant differences between body fat percentage and body mass index of males and females (14).

The main finding of this study was that there was a moderately positive correlation between the 7-m RLAT and the 30-m ST results when the entire group was evaluated together, and a there was strong positive correlation when male fencers were evaluated separately. The 7-m RLAT reflects the nature of the branch due to the use of the steps made in the fencing and the distances covered in the test. Branch-specific tests allow athletes to reflect their performance better because they include the relevant technical skills and movement patterns and can often be performed on the field and with equipment that the athlete is accustomed to. In another branch-specific test developed by Tsolakis, Kostaki (13) fencing steps are performed 5-m forward and backward three times, but this test does not include all the basic movement patterns in the characteristic of fencing because there is no lunge movement. Accordingly, Turner et al. developed the 7-m RLAT that we used in this study, which includes a change of direction in the guard position and lunge. The test includes a total of five lunges and the total distance traveled is 46 m. This loading intensity and time reflects the feature of speed endurance. In this way, information about the speed endurance level of the participants is gained and branch-specific skills are measured.

The relationship between repetitive speed tests and anaerobic power has been shown in the literature (6,9). In anaerobic power-based fencing, there is a relationship between anaerobic power and branch-specific tests. Tsolakis, Kostaki (13) found a relationship between vertical jump and speed endurance tests, which include fencing-specific 5-m shuttles. Turner, Marshall (17) found a relationship between the 7-m RLAT and the vertical jump test and agility. In a study conducted with ice hockey players, no relationship was found between the tests performed off-ice and those performed on-ice. These findings highlight the importance of branch-specific tests (8). In accordance with the literature, in the current study, a relationship was found between the 30-m ST and branch-specific test results, except in the female fencer group. Although the 30-m ST and 7-m RLAT of the females were not statistically different from the males, the absence of a relationship in the female fencer group may be due to the low number of female fencers.

In the present study, we could not reach all licensed sabre fencers in the same age group; therefore, the number of participants can be stated as a limitation of the study. Further research might investigate the relationship between standard tests and branch-specific tests in other fencing branches (foil and epee). Thus, effective performance tests can be recommended to trainers and athletes in each branch to determine fencer performance.

CONCLUSION

Determining the body composition, branch-specific test and 30-m ST data of sabre fencers in the 10-12 age group will contribute to filling the gap in the literature regarding this branch. In addition, the positive correlation between the 7-m RLAT and the 30-m ST in male sabre fencers suggests that this branch-specific test may also give an idea for speed performance evaluation in this group.

REFERENCES

1. Aktaş HN, Aslan CS. The examination of relationship between body composition and velocity on amateur soccer players. Journal of COMU Sport, 2018; 1(1): 17-25.
2. Diedhiou AB, Dicle A, Akalan C. The relation of body composition and riding techniques with success in equestrian sports. Journal of Sports Education, 2019; 3(3): 88-94.
3. Gökhan İS, Aktaş Y. The effect of 6 weeks of non-training on body composition of women volleyball players in the

university team. Journal of Physical Education and Sports Sciences, 2020; 14(2): 225-232.

4. Guilhem G, Giroux C, Couturier A, Chollet D, Rabita G. Mechanical and muscular coordination patterns during a high-level fencing assault. Medicine & Science in Sports & Exercise, 2014; 46(2): 341-350. https://doi.org/10.1249/MSS.0b013e3182a6401b
5. Kosova S, Gümüş H, Koca Kosova M, Tok Mİ. The effect of acute vibration on visual reaction time in fencers. Sportis, 2020; 6(3): 517-532. https://doi.org/10.17979/sportis.2020.6.3.6045
6. Lockie RG, Moreno MR, Orjalo AJ, Stage AA, Liu TM, Birmingham-Babauta SA, Risso FG. Repeated-sprint ability in Division I collegiate male soccer players: Positional differences and relationships with performance tests. The Journal of Strength & Conditioning Research, 2019; 33(5): 1362-1370. https://doi.org/10.1519/JSC.0000000000001948
7. Pekel HA, Balcı ŞS, Arslan Ö, Bağcı E, Aydos L, Tamer K, Kalemoğlu Y. Evaluation of some anthropometric and performance-related physical fitness parameters in children athletes. Kastamonu Education Journal, 2007; 15(1): 427-438.
8. Peterson BJ, Fitzgerald JS, Dietz CC, Ziegler KS, Baker SE, Snyder EM Off-ice anaerobic power does not predict on-ice repeated shift performance in hockey. Journal of strength and conditioning research, 2016; 30(9): 2375-2381. https://doi.org/10.1519/JSC.0000000000001341
9. Pyne DB, Saunders PU, Montgomery PG, Hewitt AJ, Sheehan K. Relationships between repeated sprint testing, speed, and endurance. The Journal of Strength & Conditioning Research, 2008; 22(5): 1633-1637. https://doi.org/10.1519/JSC.0b013e318181fe7a
10. Redondo JC, Alonso CJ, Sedano S, De Benito AM. Effects of a 12-week strength training program on experimented fencers' movement time. The Journal of Strength & Conditioning Research, 2014; 28(12): 3375-3384. https://doi.org/10.1519/JSC.0000000000000581
11. Roi GS, Bianchedi D. The science of fencing. Sports Medicine, 2008; 38(6): 465-481. https://doi.org/10.2165/00007256-200838060-00003
12. Tsolakis C, Bogdanis G, Vagenas, G. Anthropometric profile and limb asymmetries in young male and female fencers. Journal of Human Movement Studies, 2006; 50(3): 201-215.
13. Tsolakis C, Kostaki E, Vagenas G. Anthropometric, flexibility, strength-power, and sport-specific correlates in elite fencing. Perceptual and motor skills, 2010; 110(3 suppl): 1015-1028. https://doi.org/10.2466/pms.110.3c.1015-1028
14. Tsolakis C, Tsekouras YE, Daviotis T, Koulouvaris P, Papaggelopoulos PJ. Neuromuscular Screening to predict young fencers' performance. Biology of Exercise, 2018; 14(1): 103-117. https://doi.org/10.4127/jbe.2018.0134
15. Turna B. The Effect of agility training on reaction time in fencers. Journal of Education and Learning, 2020; 9(1): 127-135. https://doi.org/10.5539/jel.v9n1p127
16. Turner AN, Bishop CJ, Cree JA, Edwards ML, Chavda S, Read PJ, Kirby DM. Do fencers require a weapon-specific approach to strength and conditioning training? The Journal of Strength & Conditioning Research, 2017; 31(6): 1662-1668. https://doi.org/10.1519/JSC.0000000000001637
17. Turner AN, Marshall G, Phillips J, Noto A, Buttigieg C, Chavda S, Kilduff L. Physical characteristics underpinning repetitive lunging in fencing. Journal of strength and conditioning research, 2016; 30(11): 3134-3139. https://doi.org/10.1519/JSC.0000000000001402
18. Wylde JM, Tan FH, O'Donoghue GP. A time-motion analysis of elite women's foil fencing. International Journal of Performance Analysis in Sport, 2013; 13(2): 365-376. https://doi.org/10.1080/24748668.2013.11868654

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Evaluation of Athletic Identity in Elite Fencers

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Abstract

The objective of the research was to analyze and comment on the sportive identities of the star, young and great athletes actively participated in competitions in our country, became involved among the first 16 athletes in formal classifications (in their own categories) of Turkey Fencing Federation between 2016-2017, and attended in the Big National Team Camp held in the county Antalya/Alanya between the dates of 18-29/8/2016 and the Star-Young Europe Championship Preparation Camp held in the province Ankara between the dates of 18-26/2/2017. The research group consisted of 64 athletes invited to the relevant national team camps in the 2016-2017 season. Based on the survey model, within the relevant study, Athletic Identity Scale which was developed by Brewer and Cornelius (1), and also validated and made reliable in Turkish by Çetinkaya (5), was used. In evaluation of data and estimation of values, the SPSS 16.0 statistical package program was utilized. Data was summarized with averages and standard deviations. Since data showed a normal distribution, independence group t-test for pair comparisons, One Way Variance Analysis (anova) for multiple comparisons were preferred. In this study, scale reliability coefficient was calculated as .74. The significance level was regarded as 0.05 in this study. As a result of the research; it was concluded that there were no significant differences in the average points from the Athletic Identity Scale in accordance with the gender variable; there was a significant difference in favour of the participants, aged 15-18, graduating from high school and below in accordance with the age and education background variable among 64 athletes invited to the relevant national team camps in the 2016-2017 season.

Key Words: Fencing, Athletic Identity, National Athlete

Elit Eskrimcilerde Sporcu Kimliğinin Değerlendirilmesi

Özet

Bu araştırmanın amacı, ülkemizde faal olarak yarışmalara katılan ve Türkiye Eskrim Federasyonun 2016-2017 sezonu resmi klasman sıralamalarında (kendi kategorilerinde) ilk 16 sporcu arasında yer alan, 18-29/8/2016 tarihleri arasında Antalya/Alanya ilçesinde yapılan Büyükler Milli Takım Kampı ve 18-26/2/2017 tarihleri arasında Ankara ilinde yapılan Yıldız-Genç Avrupa Şampiyonası Hazırlık Kampına katılan yıldız, genç ve büyük sporcuların sporcu kimliklerini incelemek ve yorumlamaktır. Araştırma grubunu; 2016-2017 sezonunda bahsi geçen milli takım kamplarına davet edilen 64 sporcu oluşturmaktadır. Tarama (survey) modeli esas alınarak yürütülen bu çalışmada; Brewer ve Cornelius (1) tarafından geliştirilen, Türkçe geçerlilik ve güvenirliliği Çetinkaya (5) tarafından yapılan Sporcu Kimliği Ölçeği kullanılmıştır. Verilerin değerlendirilmesinde ve hesaplanmış değerlerin bulunmasında SPSS 16.0 istatistik paket program kullanılmıştır. Veriler yüzde, ortalama ve standart sapmalar verilerek özetlenmiştir. Veriler normal dağılım gösterdiğinden dolayı ikili küme karşılaştırmaları için bağımsız grup t testi, ikiden fazla küme karşılaştırmaları için Tek Yönlü Varyans Analizi (ANOVA) kullanılmıştır. Bu çalışma kapsamında ölçek güvenirlik katsayısı .74 olarak hesaplanmıştır. Araştırmada anlamlılık düzeyi 0.05 olarak alınmıştır.Araştırma sonucunda; 2016-2017 sezonunda bahsi geçen milli takım kamplarına davet edilen 64 sporcunun , Sporcu Kimliği Ölçeği ortalama puanlarının cinsiyet değişkenine göre anlamlı düzeyde farklılaşmadığı; Yaş ve Eğitim değişkenine göre ise 15-18 yaş arası ile Lise ve Altı eğitim düzeyine sahip katılımcılar lehine anlamlı düzeyde bir farklılık olduğu tespit edilmiştir.

Anahtar Kelimeler: Eskrim, Sporcu Kimliği, Milli Sporcu

INTRODUCTION

Today, "identity" concept has become a fundamental concept that concerns many sciences such as sociology, social psychology, philosophy, literature, political sciences, and anthropology. The fact that many disciplines make an effort to approach the same concept with their own perspectives also contribute to the rapid development of the relevant literature (6). Identity concept that helps to understand individuals in social life, has become a concept that arouse interest. Especially researchers working on psychology argue many views on the effects of identity on social environment and social life. (12).

The place of sports in human health is getting more and more important from past to present. Sports are thought to be a supporter of the moral character development of the individual or individuals, while making an important contribution to the psychological development of the individual, as well as the physical development (9). Although it is not possible to deal with sports apart from psychology due to its nature, it is seen that the concept of identity is often used with the expression "athlete identity" in sports sciences. According to Brewer et al. (2), athlete identity is a part of self-identity, and status of alignment with sports and being powerful and privileged. The effort to better understand the psychological, emotional, and behavioral aspects of athletes in the field of sports science has led researchers to focus on the self-identity of athletes. Athlete identity, in this regard, is the level of an individual's self-identification with athlete roles in relation to the concept of self (13). Athlete identity is considered as a part of multifaceted personal identity. In other words, it is a dimension of the extent to which a person perceives and characterizes himself/herself as an athlete and a multifaceted self-perception (4).

Studies show that strong athlete identity is positively associated with strong self-identity, more social interaction, higher confidence level, and more positive sports experience. On the other hand, it has been emphasized that athletes who put sports at the center of their lives excessively will experience various physical and psychological problems such as doing excessive sports, malnutrition, injury and continuing to do sports despite the injury. (15). In recent years, there are many areas in the literature that are associated with the identity of the athlete, which has started to play a very important role in supporting social life rather than success related to sports. For example, in the article of Graupensperger et al. (10) titled (2020) Social (Un)distancing: Teammate Interactions, Athletic Identity, and Mental Health of Student-Athletes During the COVID-19 Pandemic, With the corona virus affecting the whole world, it has been stated that the mental health and other social negative effects of the athletes who move away from their working tempo are more easily eliminated with their high athlete identity perceptions. The aim of this study is to examine the effects of athlete identity on different variables in elite level fencing athletes in our country.

METHOD

In this study carried out on the basis of the survey model; The Athlete Identity Scale, developed by Brewer and Cornelius (1) and for which validity and reliability in Turkish established by Çetinkaya (5), was used. The relevant scale consists of 10 items and is 5-point Likert type. Moreover, while the data were collected with the Athlete Identity Scale , some personal information of the referees who participated in the study were also collected. These are age, gender, education, duration of sportive experience, national sportsmanship category, and the sportive experiences and educational status of the family members of the participants.

The research population consists of 64 athletes, 34 (53.1%) women and 30 (46.9%) men from young and adult categories, who actively participating in the competitions and being among the first 16 athletes in the official classification rankings (in their own categories) of the Turkish Fencing Federation for the 2016-2017 season, and who participated in the Seniors National Team Camp held in Antalya/Alanya district between 18-29/8/2016 and the Junior-Youth European Championship Preparation Camp held in Ankara between 18-26/2/2017

The scale forms were distributed to the participants who volunteered to answer the form, after making the necessary explanations by the researcher, and approval was obtained from the Non-Interventional Clinical Research Ethics Committee of Selçuk University Faculty of Sports Sciences. SPSS 16.0 statistical package program was used to evaluate the data and find the calculated values. Data are summarized with percentages, mean and standard deviation values. Whether the data showed normal distribution or not was checked

with Kurtosis - Skewness Coefficient range, and it was determined that the data were normally distributed, since the range did not exceed the values of +2.0 and -2.0 (8). Since the data showed normal distribution, independent group t-test was used for pairwise cluster comparisons, and One-Way Variance Analysis (ANOVA) was used for comparisons of more than two clusters. In the research, the level of significance was taken as 0.05.

RESULTS

Table 1. The distribution of the identical information that belongs to the fencers attended the research

Variables		**f**	**%**
Gender	Male	34	53,1
	Female	30	46,9
	Total	**64**	**100,0**
Age	15-18 Years	40	62,5
	19 Years and Over	24	37,5
	Total	**64**	**100,0**
Education Status	High school and below	37	57,8
	University and over	27	42,2
	Total	**64**	**100,0**
License Duration	1-5 Years	15	23,4
	6-10 Years	34	53,1
	11 Years and Over	15	23,4
	Total	**64**	**100,0**

When Table 1 is examined, 53.1% (n=34) of the athletes participating in the research are female and 46.9% (n=30) are male athletes. As a result of the examination of the participants by age groups, it was determined that 62.5% (n=40) of the participants were between the ages of 15-18 and 37.5% (n=24) were athletes aged 19 and older. As a result of the examination of the athletes according to the variable of educational status, it was observed that the majority of them were athletes with a high school or lower education level with a rate of 57.8% (n=37), and according to the variable of athlete license duration, the athletes with 6-10 years of experience constitute the majority with a rate of 53.1% (n=34).

Table 2. T-Test Results of Point Averages of Athletic Identity Scale in Accordance with the Gender Variable of the Fencers Participated in the Research

	Gender	**N**	**X**	**Ss**	**Sd**	**t**	**P**
Athletic Identity Scale (Total)	Male	30	3,88	0,68	62	0,39	0,969
	Female	34	3,87	0,79			

When Table 2 is examined, as a result of examining the athletes participating in the research according to the gender variable, no statistically significant difference was observed in the Average Scores of the Athlete Identity Scale.

Table 3. T-Test Results of Point Averages of Athletic Identity Scale in Accordance with the Age Variable of the Fencers Participated in the Research

	Age	**N**	**X**	**Ss**	**Sd**	**t**	**P**
Athletic Identity Scale (Total)	15-18 Years	40	4,04	0,67	62	2,389	**0,026***
	19 Years and Over	24	3,60	0,77			

*P<0.05

When Table 3. is examined, the results of the analysis of the athletes participating in the research according to the age variable, [t(62)=2.389; P<0.05] A statistically significant difference was observed in the Mean Scores of the Athlete Identity Scale in favor of the participants aged 15-18.

Table 4. T-Test Results of Point Averages of Athletic Identity Scale in Accordance with the Age Variable of the Fencers Participated in the Research

	Education	N	X	Ss	Sd	t	P
Athletic Identity Scale (Total)	15-18 Years	37	4,05	0,67	62	2,203	**0,036***
	19 Years and Over	27	3,65	0,77			

*P<0.05

When Table 4 is examined, the results of the examination of the athletes participating in the research according to the education level variable, [t(62)=2.203; P<0.05] A statistically significant difference was observed in the Athlete Identity Scale Mean Scores in favor of the participants with high school and below education level.

Table 5. Anova Test Results of Point Averages of Athletic Identity Scale in Accordance with the Age Variable of the Fencers Participated in the Research

	License Duration		N	X	Ss	Sd	F	P
Athletic Identity Scale (Total)	A	1-5 Years	15	4,006	0,846	2		
	B	6-10 Years	34	3,979	0,683	61	2,202	0,119
	C	11 Years and Over	15	3,540	0,684	63		

When Table 5 is examined, as a result of examining the athletes participating in the research according to the variable of athlete license duration; It has been determined that there is no significant difference between the participants with a license period of 1-5 years, 6-10 years and 11 years or more.

CONCLUSION and DISCUSSION

While it was observed that the perceptions of the athlete identity of the fencers who participated in the research, which were examined with different variables, did not differ statistically according to the gender and duration of experience variable, however statistically significant differences were determined according to the age and education variable. It has been determined that the average score of the participants with high school and below education level is higher than the athletes with an associate degree and above education level. This may be due to the fact that all of the athletes do not plan a sports-oriented life in their future plans. It is thought that the perception of athlete identity may be low, especially among the athletes who receive training for different occupational groups. According to the age variable, the average score of the athletes aged 15-18 is higher than those aged 19 and older; It may be due to the different branch-oriented success desire or goals of the athletes. The thought that younger athletes will have a relatively long-term sports career compared to the other group may affect their perception of athlete identity.

We see that the perception of athlete identity has been examined in quite different groups and athletes interested in different sports branches in recent years in the literature. In the study conducted by Yanar et al. (16) on tennis and badminton players, it was determined that the mean scores of the athletes did not differ statistically according to the gender variable. In the study conducted by Can and Kaçay (4) on 156 different athletes, no difference was found regarding the variables of gender, age and sports year (experience). In the study of Doğaner et al. (7) conducted on table tennis, tennis and badminton players, it was determined that the perceptions of athlete identity did not differ statistically on the basis of age and gender. In the study conducted Baba Kaya et al. (2018), it was determined that the athlete identity perceptions of the participating athletes did not differ from each other according to the age variable but differed significantly in favor of male participants according to gender variable. There are parts of our research that show similarities with the studies conducted, and different results from other studies were found, especially for the age variable. This can be explained by the fact that the age range of the fencers participating in the research is relatively higher than in other studies. Especially in studies involving university students or professional athletes, the age variable is above a certain age, and the age range is wider in our research.

Athlete identity is a subject that has been examined not only in national studies but also in international dimension. In the study conducted by Cabrita et al. (3) on 442 athletes in Spain, in which

the variables of athlete identity and exercise addiction were examined, significant differences were found in gender and age variables. In addition, apart from only age, gender and similar demographic variables, in the qualitative study of Poucher and Tamminen (14) on 13 Canadian elite athletes, it was emphasized that the effects of athlete identity were observed at a high level in professional athletes, ad it has been determined that while interpreting the success of the athletes, they refer to issues such as individual work, desire and so on, but they make statements based on external factors when talking about their failures. In addition, factors such as family, coaches, friends or social environment may be effective in sporting success, but the effect of individual athlete identity, which has a strong influence, was also emphasized in a study conducted on Japanese college students (11).

Athlete identity is seen as an important factor affecting sportive success, apart from physical training adequacy. There are opinions in this way in many studies. In addition to the physical development of the athlete, psychological readiness can increase athlete's success. However, taking into account the data of our study, measures and investments to be taken in order to increase the perception of the identity of the athlete, especially among the athletes aged 19 and older and those with an associate degree and undergraduate level of education, will contribute to the development of the fencing branch.

REFERENCES

1. Brewer BW, Cornelius AE. Norms and factorial invariance of the Athletic Identity Measurement Scale (AIMS). Academic Athletic Journal. 2001;15:103-113.
2. Brewer BW, Van R, Linder DE, "Athletic identity: Hercules' muscles or Achilles heel?". Int. Journal Sport Psychol, 1993;24:237-254.
3. Cabrita T, Rosado A, De La Vega R, Serpa S. Identidad atlética y características del atleta como predictor de la dependencia al ejercicio. Revista de Psicología Del Deporte. 2018; 27(2): 99–106.
4. Can Y, Kaçay Z. Investigation of the relationship between athlete identity perception, courage and self-confidence. journal of Human Sciences. 2016; 13(3):6176-6184.
5. Çetinkaya T. Takım sporlarında sporcu kimliği ve sürekli sportif kendine güven ilişkisi. Gazi Üniversitesi Eğitim Bilimleri Enstitüsü, Doktora Tezi. 2015:31.
6. Dalbay RS. "Identity" And Concept Of "Social Identity". Journal of Süleyman Demirel University Institute of Social Sciences. 2018;2(31): 161-176.
7. Doğaner S, Görmüş M, Kılıç MÖ. Investigation Of The Relationship Between Athletes Identity And General Self-Efficacy In Terms Of Different Variables. The Journal of International Social Research. 2020; 13 (69).
8. George D, Mallery M, SPSS for Windows Step by Step: A Simple Guide and Reference, 17.0 update (10 aed.) Boston: Pearson. 2010.
9. Görgülü R, Adiloğolları EG, Tosun ÖM, Adiloğolları İ. The Investigation Of Prosocial And Antisocial Behaviour And Athlete Identity According To Some Variables. Journal of Sports and Performance Researches. 2018;9(3):147-16.
10. Graupensperger S, Alex J.B, Jason R.K, M. B. Athletic Identity,and Mental Health of Student-Athletes During the COVID-19Pandemic. Journal of Adolescent Health Social (Un)distancing: Teammate Interactions. 2020; 67(5): 662-670.
11. Hagiwara G, Jiro K, Kazushige O, Hironobu S, Takuya M. Relationships between athletic identity and the two dimensions of sport commitment of Japanese student athletes. Journal of Physical Education & Sport. 2018;18(3)1514–1517.
12. Loannis P . The role of dispositional factors achievement goals and volition in the formation of athletic identity people with physical disability. Physical Activity Review, 2020; 8(1): 87-94.
13. Öztürk P, Koca C.Examining Psychometric Properties of The Turkish Version of Athletic Identity Measurement Scale. Hacettepe Journal of Sport Sciences. 2013;24(1):1–10.
14. Poucher ZA, Tamminen KA. Maintaining and managing athletic identity among elite athletes. Revista de Psicología Del Deporte. 2017;26:63–67.
15. Saraç L, Toprak N, An Investigation Of The Relatonship Between Athletic Identity And Homophobia Among A Sample Of University Student- Athlete Candidates. Spormetre, 2017; 15 (2):79-84.
16. Yanar S, Özlem K, Yusuf C. Analysıs Of Tennis And Badminton Athletes' Differences Between Athlete Identity Perception And Achievement Motivation Levels, Spor Eğitim Dergisi. 2017;1(1): 51-58.

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Adaptation of Sport Fanaticism Scale Into Turkish

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Abstract

Sometimes positive and sometimes negative meanings can be attributed to fanaticism in sports. For sports marketers, fanatics are valued customers of the brand and form a framework of social approval in terms of social identity, relationship and self-esteem. In addition, the violent extreme behavior of fanatics is seen in a socially unacceptable framework. This study, which was carried out due to the need for a valid and reliable measurement tool to measure sports fanaticism for these different fields of study, aims to determine the validity and reliability of the Sport Fanaticism Scale developed by Dwyer, LeCrom and Greenhalgh (19) in Turkish conditions. The 5-point Likert type scale consisting of 12 items was applied to 528 participants who are supporters of Besiktas, Fenerbahce, Galatasaray and Trabzonspor clubs. Confirmatory factor analysis (CFA) was performed using the AMOS program to examine the four-factor structure of the scale. It was observed that the values of fit indices are at good or excellent level in all parameters (χ^2/sd= 2.91); RMSEA=.060; GFI=.96; CFI=.95; IFI=.95; AGFI =.93). The results show that the 12-item scale is consistent with the original four-factor structure and is compatible with the data. For the reliability of the scale, the internal consistency coefficients of the entire scale and its sub-dimensions were checked. In addition, Cronbach's Alpha and AVE and CR values were also calculated within the scope of the internal consistency reliability of the scale and the coefficients were found to be sufficient. Test-retest reliability analysis of the scale was also performed at three-week intervals. In the light of these findings, it was concluded that the "Sports Fanaticism Scale" is a valid and reliable measurement tool that is compatible with the Turkish cultural structure.

Keywords: Sport fanaticism, validity, reliability, confirmatory factor analysis, adaptation of scale

Spor Fanatizmi Ölçeğinin Türkçe'ye Uyarlanması

Özet

Sporda fanatikliğe bazen olumlu bazen olumsuz anlamlar yüklenebilmektedir. Fanatikler spor pazarlamacıları için markanın değerli müşterileri olmakla birlikte sosyal kimlik, ilişki ve benlik saygısı açısından sosyal bir onay çerçevesi oluşturur. Bunun yanında fanatiklerin şiddet içeren aşırı davranışları sosyal olarak kabul edilemez bir çerçevede görülmektedir. Bu farklı çalışma alanları için de spor fanatizmini ölçecek geçerli ve güvenilir bir ölçme aracına ihtiyaç duyulması nedeniyle gerçekleştirilen bu çalışma, Dwyer, LeCrom ve Greenhalgh (19) tarafından geliştirilen Spor Fanatizmi Ölçeğinin (Sport Fanaticism Scale) Türkiye koşullarında geçerliliğini ve güvenilirliğini belirlemeyi amaçlamaktadır. 12 maddeden oluşan 5'li likert tipindeki ölçek, Beşiktaş, Fenerbahçe, Galatasaray ve Trabzonspor kulüplerinin taraftarı olan 528 katılımcıya uygulanmıştır. Ölçeğin dört faktörlü yapısının incelenmesi için AMOS programı kullanılarak doğrulayıcı faktör analizi (DFA) yapılmıştır. Uyum indeksleri değerlerinin tüm parametrelerde iyi veya mükemmel seviye de olduğu görülmüştür (χ^2/sd= 2.91); RMSEA=.060; GFI=.96; CFI=.95; IFI=.95; AGFI =.93). Elde edilen sonuçlar, 12 maddelik ölçeğin dört faktörlü özgün yapı ile tutarlı ve verilerle uyumlu olduğunu göstermektedir. Ölçeğin güvenilirliği için, ölçeğin tamamının ve alt boyutlarının iç tutarlılık katsayıları kontrol edilmiştir. Ayrıca, ölçeğin iç tutarlık güvenirlik kapsamında Cronbach's Alpha ve AVE ile CR değerleri de hesaplanmış ve katsayıların yeterli düzeyde olduğu bulunmuştur. Ölçeğin üç hafta ara ile test-tekrar test güvenirlik analizi de yapılmıştır. Elde edilen bu bulgular ışığında, "Spor Fanatizmi Ölçeği''nin Türk kültür yapısıyla uyumlu, geçerli ve güvenilir bir ölçüm aracı olduğu sonucuna ulaşılmıştır.

Anahtar Kelimeler: Spor fanatizmi, Geçerlilik, Güvenilirlik, Doğrulayıcı faktör analizi, Ölçek uyarlama

INTRODUCTION

Fanaticism is an attitude that can be observed in many areas such as politics, religion, entertainment, fashion and sports. In terms of attitude and behavior, although examples of fanaticism are seen frequently, the concept of fanaticism does not have an agreed definition. The Latin root of the word fanaticism is fanum, which means temple or sacred place. Fanaticus, "inspired by God, frantically excited, enthusiastic" (67), is an adjective used to describe those who are literally devoted to the temple with extreme madness (49). In English, the word fanatic is used to mean a person with religious madness, dreamy and irrational passions (16). Fanaticism, as the definitions suggest, is a devotion or a form of attachment. The meaning of the term fanaticism varies considerably. For this reason, being a fan of sports teams can sometimes be attributed to positive and sometimes negative meanings. On the one hand, fanaticism expresses love and commitment to a team to the death within the framework of social approval, on the other hand, it expresses extreme behavior, including violence, in a socially unacceptable framework (40). The relationship of fanatics with a brand (team) is similar to an interpersonal relationship (1) and therefore emotional fluctuations can be experienced that cause positive and negative behavioral responses (57). According to Galeano (27), fanatical individuals feel attached to their team with much greater power and this commitment can reach the point of sacrificing one's life for the team.

Currently, sports sociology provides preliminary insights that help advance our understanding of the development of fanaticism and this unique form of loyalty, the theories of social psychology adopted in fan loyalty research. For example, the concept of socialization offers information that can explain the process of individuals' acquaintance with the brand, which later became the object of fanaticism. Factors that help socialization, such as family, peers, school, and community, also attract the attention of sports scientists in order to learn to accept the values, goals, beliefs, attitudes, and norms of the fan culture (38, 65). These theories (social identity, relationship, and self-esteem theories) have also helped explain attachment theories for insights into how an individual can develop sympathy for an object and how one can become fanatical through the attachment process. Fanaticism is a unique form of loyalty characterized by strong and intense attachment, devotion, loyalty, passion, emotional commitment, enthusiasm and engagement (11, 14, 25, 47, 48, 53). However, the frequency and severity of team-related behavior varies widely among sports fans, because the emotion and passion associated with sports team support leads to intense attachments for some and temporary relationships for others (52, 64). Pooley (51) stated that ordinary sports spectators were simple observers and that they forgot about the sports event shortly after its completion, while the feelings of the more fanatical fans towards the team increased too much, therefore, s/he continued his/her interest in the event by devoting a large part of the day to his/her own team and events in the sports environment.

Fanaticism or fanatic behavior has been studied for more than a decade (19). According to the studies, fanaticism means the character of the belief between the fans and their teams. Fanatic fans display behaviors such as higher level of knowledge, more anxiety, and higher arousal level than normal fans while watching their teams (9, 66). Interaction with the club is very valuable for fanatic fans. Fans participate in website discussions and email comments, and are willing to join fan groups. They actively follow sports bulletins through communication channels and subscribe to the printed magazines of the clubs they are a fan of. Finally, it is known that fanatics spend more time discussing with other fans or non-supporters (20).

In addition to being an important leisure activity, sports fans constitute the great majority in the sports industry and its popularity is increasing day by day (12, 44). Shank (57) stated that "if sports event is the heart of the sports industry, the sports fan is the blood that makes this heart beat", emphasizing the importance sports fans have in the sports industry and argued that the sports industry cannot survive without fans. In other words, sports fans are vital for sports organizations not only in terms of the revenues from ticket sales but also in terms of sponsorship and media revenues (46). Besides, for sports marketers, fans are unique consumers because their interest in a brand is a self-sustaining phenomenon (50). They act voluntarily to protect the brand and preserve the brand's existence and heritage (18, 23, 24, 50, 55). Fanatic consumers show deep affection for the teams they are fans of and remain loyal to them despite their poor performance (35, 36, 54, 68). Fanatics are valued customers of a brand and are attractive to marketers for a variety of reasons. For example, some fanatics

have excessive consumption tendencies, which means excessive use and purchasing (34). They act as opinion leaders to guide others and attract new fans on behalf of the club (54). Fanatics also make great personal and financial sacrifices to support the brand, such as actively participating in brand communities (26, 47). Their support is consistent, enduring, and resistant to attempts to destroy their relationship by ignoring marketing messages from competing brands (38). Hugenberg (35) explains that organizations are enriched as a result of fan loyalty. For these reasons, in terms of sports scientists, the analysis of fanaticism in studies on sports fans is always among the current issues worth researching (30, 42).

In the literature, it was seen that a single scale was used in studies on fan fanaticism in our country (21, 37, 43, 61). One of the reasons for this situation is the limitation of suitable measurement tools to determine the level of fanaticism of sports fans in this field. In addition, this mostly used scale (62) was developed for the classification of the audience, supporters and fanatic attitudes of the football audience under two factors [thought and action tendency towards violence and institutional belonging]. The lack of a valid and reliable measurement tool draws attention that can reveal the tendency of fanaticism, especially behaviors such as instigation, committed interaction,vicarious impact, and superstition, and that can be used in all sports branches.Considering this situation, it is aimed to adapt the Sport Fanaticism Scale developed by Dwyer, LeCrom and Greenhalgh (19) to Turkish with this study. It is thought that the adapted measurement tool will make significant contributions to the relevant literature. The first of these contributions will help identify fanatic fans for sports marketers, based on the fact that fanatical fans are valuable customers of sports clubs (47). Both theoretical and practical information will be presented to sports clubs and sports marketers. The second contribution is that the behavior of fanatics and hooligans, who are thought to be at the center of violent incidents that pose an important threat to the future of sports, can be examined through various studies. Accordingly, the Sports Fanaticism Scale adapted in this study is expected to help researchers by filling the gap in the literature.

METHOD

Study Group

The sample of this study consists of fans who follow the competitions of Beşiktas, Fenerbahce, Galatasaray and Trabzonspor clubs, which are called four big teams and are in different branches. While determining the sample size in the study, the rule suggested by Hair et al. (29) that the sample group should be at least 10 times the number of items/variables in the scale was taken into account. The convenience sampling method, which is one of the non-probabilistic sampling techniques, was deemed appropriate as the sampling selection in the study. This technique is based on the principle that anyone who responds to the questionnaire can be included in the sample (4).

A total of 528 club fans, 419 (79.4%) male and 109 (20.6%) female, who are supporters of Beşiktas, Fenerbahce, Galatasaray and Trabzonspor using Facebook and Twitter platforms, participated in the study. An online questionnaire form on the sports fanaticism of the fans was shared through Facebook and Twitter platforms. The data were collected between 15 and 22 March 2021. The mean age of the group is 21.79±4.68. Of the fans participating in the study, 287 (54.4%) were fans of Galatasaray, 92 (17.4%) were Besiktas, 73 (13.8%) were Fenerbahce and 76 (14.4%) were Trabzonspor club fans. The majority of the fans (89%) were determined to follow other club branches other than football.

Data Collection Tool

Personal Information Form

The personal information form created by the researchers was used to obtain descriptive information on the fans about their age, gender, marital status, education level, profession, the club they are fans of, the sport they are interested in/supporters of.

Sport Fanaticism Scale:

The original Sport Fanaticism Scale (SFS) is a scale developed to measure the fanaticism behavior of sports audiences. The original form of the scale developed by Dwyer, LeCrom and Greenhalgh (19) consists of 12 items. SFS consists of four factors and twelve items: Instigation (3 items), Committed Interaction (3 items), Vicarious Impact (3 items) and Superstition (3 items). All items in the scale are positive. The application time of the scale varies between 15 and 20 minutes. Participants indicate

their degree of agreement with each statement in the scale, ranging from never (1) to always (5).

Dwyer, LeCrom, and Greenhalgh (19) examined the construct validity of the original scale with confirmatory and exploratory factor analysis. In explaining the scale created after qualitative interviews, an exploratory factor analysis (EFA) was performed on an independent sample. According to the results of exploratory factor analysis within the scope of the validity studies of the Sport Fanaticism Scale, which was carried out with 223 participants who graduated from Mid-Atlantic University [college athletics (36%), National Football League (33%), Baseball league (16.6%)], it was reported that the 13-item and four-factor structure explained 76% of the variance and the factor loadings varied between 0.61 and 0.95 .The scale was composed of 12 items and 4 sub-dimensions by removing one item out of 13 items by taking expert opinion. The cronbach alpha values obtained for the scale items and dimensions were reported as .767 for the instigation sub-dimension, .801 for the commitment interactionsub-dimension, .797 for the vicarious impact sub-dimension, and .79 for the superstition sub-dimension.

In the study conducted to verify the created structure, 266 participants who are supporters of the Philadelphia Region College and international teams were selected as the sample. Confirmatory factor analysis showed that the four-factor structure fits well (χ^2/df=1.92, RMSEA=0.059, CFI=0.956, TLI=0.937).

Instigation, Committed Interaction, Vicarious Impact and Superstition in SFS were translated into Turkish as "Kışkırtma", "Adanmışlık", "Dolaylı Etki" and "Batıl İnanç", taking into account the opinions of experts.The Turkish form of the scale is given in (Appendix 1). Descriptions of the dimensions are given below:

Instigation: This factor represents antagonistic social interaction between sport fans and out-group sport fans through face-to-face and electronic communication (Item 1, 2, 3).

Committed interaction: This dimension embodies the determined and focused viewership by sport fans in an effort to not miss the team's performances(Item 4, 5, 6).

Vicarious impact: This factor symbolizes a sport fan's outward behavior during games and toward the team where a direct effect and/or internal connection is believed (Item 7, 8, 9).

Superstition: This dimension encompasses a sport fan's ritualistic behavior associated with team colors, jerseys, and viewership behavior (Item 10, 11, 12).

Turkish Translation Stage of Sport Fanaticism Scale

Dwyer et al. (19) the owner of the original study, was contacted by e-mail for the adaptation of the fan sports fanaticism scale to Turkish culture, and the necessary permissions were obtained. After obtaining permission for the adaptation study, the translation study was carried out with the standard translation-back translation method proposed by Brislin (10). The English form of the scale was sent to three academicians from Selcuk University School of Foreign Languages, who have good knowledge of English in their field. A single form was created by comparing the items in the three translations obtained. Afterwards, the expert evaluation form (EEF) was obtained from the field experts in order to examine the Turkish form in terms of cultural context, linguistics, research methodology, and assessment and evaluation criteria. EEF consists of two parts. In the first part, there is a summary explanation introducing the purpose of the research and the theoretical basis of the scale. In the second part, there are Likert-type 5-point rating scale (1=this item is definitely not appropriate, 5=this item is fully appropriate) and empty areas where corrections can be made. In accordance with expert opinions, in order to decide whether it is appropriate for the items in the scale to be under the relevant factor, the criteria of having an item average score of 4.0 and above and a standard deviation of 0.7 or below were taken as basis. The Turkish form, which was shaped according to the EEF, was sent to three different linguistics experts from and two academicians, who know English well in the field of sports, sciences Selcuk University School of Foreign Languages in order to be translated from Turkish into English. Forms that came from five experts by back-translation method were compared with the original form in terms of meaning and form, and the scale was finalized. During the translation process, the original form was adhered to and no expression was added to the scale. The comprehensibility of the scale was checked by face-to-face interviews with 17 students studying at Selcuk University, Faculty of Sport Sciences, Department of Sports Management.

Necessary corrections were made after the feedback obtained from the students. After this stage, the stage of applying the scale was initiated.

Analysis of Data: Validity and reliability studies of the Sport Fanaticism Scale

Before proceeding to the data collection phase, the required Ethics Committee report was received for the study. The data were collected through an online survey by sharing on social media platforms (Facebook and Twitter, etc.) between15 and 22 March 2021.

Confirmatory factor analysis-CFA was used to check the appropriateness of the scores obtained from the Turkish fans with the approach to the development of the original scale. In cross-cultural scale adaptation studies, it may be suggested to start directly with CFA for the factor design of the tool in the target culture. The reason for this is that SFS's original factor design in culture was revealed by qualitative and quantitative studies, and experimental evidence regarding the construct validity of the tool was determined. In such a case, whether SFS is preserved in the target culture in factor design can be tested with CFA. In the CFA to be made, if the model related to the original factor design of the tool is not confirmed or does not give high fit indices, then explanatory factor analysis can be used to discover the factor design in the target culture (15).

A large number of fit indices are used to determine the competence of the model tested in CFA. Fit indices are used to evaluate the fit between the theoretical model and real data. It is recommended to use more than one fit index to evaluate the fit of the model because of the strengths and weaknesses of the fit indices (41). On the other hand, there are four basic fit indices that are recommended to be reported and interpreted in SEM analyzes (40). These are Chi-Square Goodness Test (X2), Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR) and Comparative Fit Index (CFI). On the other hand, Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Incremental Fit Index (IFI) and Normed Fit Index (NFI) are among the most used fit indices (5, 7, 8, 13, 39, 60). In this study, Chi-Square Goodness Test, RMSEA, GFI, CFI, IFI and AGFI indices, which are among the values of fit index listed above, are included. The enumerations of the 531 data collected for the confirmatory factor analysis and the data collected before carrying out the CFA were evaluated. Lost data was checked on the data obtained and no lost data was detected. Later, outlier control was performed and three outliers were detected and analyzes were carried out with 528 data. Spearman correlation coefficients were calculated to determine the relationship between measurements made at two different times in linguistic equivalence and test retest studies. The Kolmogorov-Smirnov test was used to test the normality distribution of the data. In the study, the scale was examined in terms of internal consistency by using convergent validity analyzes, and in terms of reliability with the Cronbach alpha method and composite reliability analyzes. For convergent validity, all CR values for the scale are expected to be greater than the AVE values and the AVE value to be greater than 0.5. IBM SPSS 25 and AMOS 24 programs were used in the validity and reliability analysis of the data.

FINDINGS

Construct Validity of the Scale

For the construct validity of the Sport Fanaticism Scale, whether the factor structure in its original form was verified or not was examined by Confirmatory Factor Analysis (CFA). For DFA analysis, Chi-Square Goodness, GFI (Goodness of Fit Index), RMSEA (Root Mean Square Error of Approximation), CFI (Comparative Fit Index), RFI (Relative Fit Index), IFI (Incremental Fit Index) and AGFI (Adjusted Goodness of Fit Index) fit indices were checked for this study.

Table1: Fit Index Values and Acceptance Limits of Fit Indices of the Model Tested by CFA for sports fanaticism

Model Fit Index	Perfect Range	Acceptable Range	Scale Value
X2/df	$0<\chi^2/sd<2$	$2<\chi^2/sd<5$	**2.91**
RMSEA	.00<RMSEA<.05	.05<RMSEA<.08	**.060**
GFI	.95<GFI<1.00	.90<GFI<.95	**.96**
CFI	.95<CFI<1.00	.90<CFI<.95	**.95**
IFI	.95<IFI<1.00	.90<IFI<.95	**.95**
AGFI	.95<AGFI<1.00	.50<AGFI<.95	**.93**

When Table 1 is examined, it is seen that the four-factor structure produces good fit values [χ^2/sd(139,875/48=2.91); RMSEA=.060; GFI=.96; CFI=.95; IFI=.95; AGFI =.93]. In addition, the correlation values between the factors were examined and the model obtained with CFA is presented in Figure 1. When Figure 1 is examined, it is seen that the instigation sub-dimension and the superstition sub-dimension have the value .46, the instigation sub-dimension and the vicarious impact

sub-dimension have the value .51, the instigation sub-dimension and the commitment interaction sub-dimension have the value .30, and that there are moderately significant positive relationships between its sub-dimensions. It is observed that commitment interaction sub-dimension and superstition have the value .57 and commitment interaction sub-dimension and vicarious impact sub-dimension have the value .89, and that there were positive medium and high-level significant relationships between them. Vicarious impact sub-dimension and superstition sub-dimension have the value .78 and there is a high level of positive relationship between them. These values reveal that the four-dimensional model of the scale fits well.

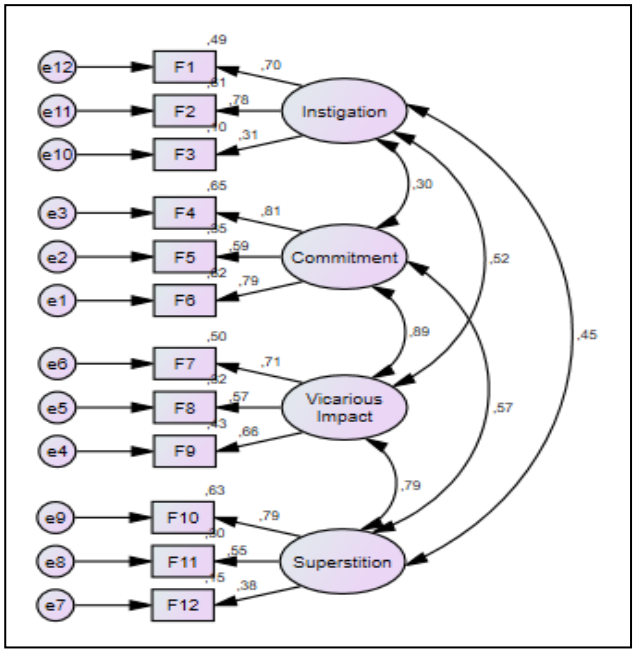

Figure 1. Sport Fanaticism Scale path diagram

Reliability Analysis of the Scale

Composite Reliability (CR), Average Variance Extracted (AVE) and Cronbach Alpha (CA) values were used to determine the reliability of the scale. In testing the construct validity of the measurement model, the convergent validity was checked by examining the AVE value expressing the mean variance extracted and the CR coefficient expressing the composite reliability. In order to ensure convergent validity, CR coefficients are expected to be greater than AVE values and AVE value to be greater than 0.50. When the sub-dimensions of the Sports Fanaticism Scale are examined, it is seen that there are sub-dimensions with an AVE value below .50. An AVE value below .50 is acceptable (17), because it was stated that if the CR value is greater than .60, an AVE lower than .50 is acceptable and the construct validity is sufficient (33). In addition, the scale indicates high reliability if the Cronbach Alpha coefficient is between 0.80 and 1.00, it is quite reliable if it is between 0.80 and 0.60, values between 0.60 and 0.40 indicate that it has low reliability, and values between 0.40 and 0.00 indicate that the scale is not reliable (2).

Table 2: Composite Reliability (CR), Average Variance Extracted (AVE), Cronbach Alpha (CA) values

Variables	Composite Reliability (CR)	Average Variance Extracted (AVE)	Cronbach Alfa (CA)
Instigation	.65	.41	.61
Committed Interaction	.84	.54	.74
Vicarious Impact	.69	.43	.64
Superstitions	.65	.41	.60
Total			.80

When Table 2 is evaluated, it is seen that the AVE values of the scale are between .41 and .54, the CR values are between .65 and .84, and the CA value is .80. In this case, we can say that the reliability of the scale is ensured.

Test-Retest Reliability: For the test-retest reliability of the sport fanaticism scale, the scale was applied to a group of 51 participants at 21 days intervals. A moderately positive and significant relationship was found between the two different times when the scale was applied (55). Therefore, it can be said that the fan fanaticism scale has test-retest reliability (r(df)= .59, p<0,01).

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

In this study, it was aimed to adapt the scale named Sport Fanaticism developed by Dwyer et al. (19) to Turkish Culture to determine the fanaticism behaviors of sports audiences. The 4-factor model in the original scale was tested with CFA and reliability coefficients were calculated.

The Spearman Correlation Coefficient results, which were made to examine the test-retest reliability and linguistic equivalence of the scale, were interpreted as providing linguistic equivalence and reliability. In the scale, as in the original, the 1stFactor was named as Instigation, the 2nd Factor as Commitment Interaction, the 3rdFactor as Vicarious Impact, and the 4th Factor as Superstition.

Cronbach's alpha reliability coefficients of the factors were found as 0.61, 0.74, 0.64 and 0.60, respectively, and 0.80 in total. Alpar (3) stated that

the scale has a high reliability if the cronbach alpha coefficient is between 0.80-1.00, it is quite reliable if it is between 0.60-0.79, it has low reliability if it is between 0.40-0.59, and it is not reliable if it is between 0.00-0.39. Based on this information, it is seen that the cronbach alpha coefficients are within acceptable limits. Another method used to test the construct validity was to examine the AVE and CR coefficients. In order to say that convergent validity is provided in the construct validity, all CR values of the scale must be greater than the AVE values and the AVE value must be greater than 0.50 (22, 28). However, it is stated that AVE value less than 0.50 will provide convergent validity provided that the CR coefficient is greater than 0.60 (22). The lowest AVE values found in our study belong to the sub-dimension of instigation, superstition with 0.41 and vicarious Impact with 0.43, and the AVE values of the commitment interaction dimension are above 0.50. CR coefficients are greater than 0.60 for all three scales. In this case, we can say that convergent validity is provided for all three scales. AVE and CR values verify the convergent validity of the scales. The values obtained are parallel to the values of the original scale.

The construct validity of the scale was tested by confirmatory factor analysis. As a result of CFA, fit index values were checked. The fit index values are as follows: χ^2/sd (139,875/48 = 2.91); RMSEA=.060; GFI=.96; CFI=.95; IFI=.95; AGFI =.93. Chi-square/sd value of less than 3 in large samples and less than 2.5 in small samples indicates perfect fit (39). GFI and AGFI values greater than 0.90 indicate good fit and greater than 0.95 indicates perfect fit (31, 59). The fact that the CFI values are above 0.95 indicates that the fit of the model is perfect (62). It is stated that the model fit is good if the RMSEA values are less than 0.08 (58). In line with this information, it is seen that the values of fit indices are at a good or excellent level in almost all parameters. As a result of the confirmatory factor analysis made, it can be said that the four-factor original structure of the Sport Fanaticism Scale is a good fit for the sample of this study by looking at the values of the fit indices. Analysis results show that the measuring tool can be used.

In conclusion, the desired characteristics of the question items in the scale and the high reliability and validity of the scale show that this scale can be used by researchers in Turkey when determining the fanaticism behaviors of the fans. On the other hand, adapting a common scale of fanaticism for the fans of different sports branches other than football will be beneficial for studies on different sports branches and fields. It is important to determine the fanatic behaviors of the fans in the fan groups in order to ensure that their behaviors are within acceptable norms. The determination, supervision and training of such fans' behaviors are of great importance in preventing fanatic behaviors and violence in sports. It is thought that the scale will contribute to the literature on this subject and will meet the deficiency in this subject.

Some limitations should be taken into account when interpreting the results of this study. First of all, the sample of the study consists of individual and team sports fans. However, in the data obtained, a comparison analysis was not conducted among these groups due to the diversity of data on which branches the fans, who also follow the branches other than football, follow. In future studies, it is thought that making comparisons for supporters of different sports branches will be useful in terms of diversifying the validity and reliability of the scales on the groups. In addition, in order to obtain stronger data regarding the validity and reliability of the Sport Fanaticism Scale that was adapted to Turkish within the scope of this research, the application of the measurement tool on the supporters involved in the violence and recorded in the police records and whether it distinguishes fanaticism in sports can be investigated in the future.

REFERENCES.

1. Aggarwal, P. The effects of brand relationship norms on consumer attitudes and behavior. Journal of Consumer Research, 2004; 31, 87–101.
2. Alpar R. Spor bilimlerinde uygulamalı istatistik. Nobel yayınları, 2006.
3. Alpar R. Spor, sağlık ve eğitim bilimlerinde örneklerle uygulamalı istatistik ve geçerlik-güvenirlik. Detay Yayıncılık, Ankara: 2010.
4. Altunışık R, Coşkun R, Bayraktaroğlu S, Yıldırım E. Sosyal bilimlerde araştırma yöntemleri: SPSS uygulamalı. Sakarya Yayıncılık, 2012.
5. Anderson JC, Gerbing DW. The effect of sampling error on convergence, improper solutions, and goodness-of-fit indices for maximum likelihood confirmatory factor analysis. Psychometrika, 1984; 49(2), 155-173.
6. Turan EB, Uğurlu A, Şakar M, Sarıkaya E. Öğrenci taraftar topluluklarının futbol fanatiklik düzeylerinin belirlenmesi: Akdeniz üniversitesi örneği. Akdeniz Spor Bilimleri Dergisi, 2018; 1(2), 74-80.
7. Bentler, P. M. (1992). On the fit of models to covariances and methodology to the Bulletin.. Psychological bulletin, 112(3), 400.

8. Bollen KA. A new incremental fit index for general structural equation models. Sociological methods & research, 1989; 17(3), 303-316.
9. Branscombe NR, Wann DL. Role of identification with a group, arousal, categorization processes, and self-esteem in sports spectator aggression. Human relations, 1992; 45(10), 1013-1033.
10. Brislin RW. The wording and translation of research instruments. (WJ Lonner ve JW Berry, Der.), Field Methods in Educational Research, 1986; 137-164.
11. Bristow DN, Sebastian RJ. Holy cow! Wait'til next year! A closer look at the brand loyalty of Chicago Cubs baseball fans. Journal of Consumer Marketing, 2001.
12. Capella ME. Measuring sports fans' involvement: The fan behavior questionnaire. Southern Business Review, 2002; 27(2), 30.
13. Cole DA. Utility of confirmatory factor analysis in test validation research. Journal of consulting and clinical psychology, 1987; 55(4), 584.
14. Cova B, Cova V. Tribal marketing: The tribalisation of society and its impact on the conduct of marketing. European journal of marketing, 2002.
15. Çokluk Ö, Şekercioğlu G, Büyüköztürk Ş. (2012). Sosyal bilimler için çok değişkenli istatistik spss ve lısrel uygulamaları (2. basım). Pegem yayınları, 2012; Ankara.
16. Dictionary OE. What Is Equity?. and Boris Pleskovic, 2006; 69.
17. Doğan RŞ, Yılmaz V. Üniversite öğrencilerinin girişimcilik niyetlerinin betimlenmesine yönelik bir yapısal eşitlik modeli önerisi. İktisadi ve idari bilimler fakültesi dergisi, 2017; 19(2), 655-675.
18. Doss EL. Elvis culture: fans, faith & ımage, University Press of Kansas, 1999; Kansas.
19. Dwyer B, Lecro C, Greenhalgh GP. Exploring and Measuring spectator sport fanaticism. communication & sport.2018; 6(1) 58-85
20. Dwyer B, Greenhalgh GP, LeCrom CW. Exploring fan behavior: Developing a scale to measure sport eFANgelism. Journal of Sport Management, 2015; 29(6). http://dx.doi.org/10.1123/JSM.2014-0201
21. Erdoğan A, Öztaş M, Şirin EF. Futbol taraftarlarının seyircilik durumları ile spor takımı evangelizm (eFANgelizm) ilişkisi üzerine ampirik bir araştırma. Manas Sosyal Araştırmalar Dergisi, 2021; 10(1), 476-484.
22. Fornell C, Larcker DF. Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 1981; 18(1), 39-50.
23. Fournier S, Yao JL. Reviving brand loyalty: a reconceptualization within the framework of consumer-brand relationships. International Journal of Research in Marketing, 1997; 14, 5, 451-72.
24. Fournier S. Consumers and their brands: Developing relationship theory in consumer research. Journal of Consumer Research, 1998; 22, 343-373.
25. Funk DC, James J. The psychological continuum model: A conceptual framework for understanding an individual's psychological connection to sport. Sport management review, 2001; 4(2), 119-150.
26. Funk DC. (1998) Fan loyalty: The structure and stability of an ındividual's loyalty toward an athletic team. Unpublished doctoral dissertation. columbous, Ohio state university, 1998.
27. Galeano E. Gölgede ve Güneşte Futbol. İspanyolca aslından çevirenler Önalp, E., Kutlu, M.N. İstanbul: Can Yayınları, 2006.
28. Hair EC, Park MJ, Ling TJ, Moore KA. Risky behaviors in late adolescence: co-occurrence, predictors, and consequences. Journal of Adolescent Health, 2009; 45, 253–261.
29. Hair JF, Black WC, Babin BJ, Anderson RE. Multivariate data analysis (7th Edition). Harlow: Pearson, 2014.
30. Heydarinejad S, Gholami S. Identification of factors of aggression incidence among football spectators in Khuzestan. Studies in Physical Culture and Tourism, 2012; 19(1), 37-41.
31. Hooper D, Coughlan J, Mullen M. Structural equation modelling: Guidelines for determining model fit. Electronic Journal of Business Research Methods, 2008; 6(1), 53–60.
32. Hu LT, Bentler PM. Cut-off criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling, 1999; 6, 1-55.
33. Huang CC, Wang YM, Wu TW, Wang PA. An Empirical Analysis of the Antecedents and Performance Consequences of Using the Moodle Platform. International Journal of Information and Education Technology, 2013; 3 (2). doi: 10.7763/IJIET.2013.V3.267.
34. Huffman C, Ratneshwar S, Mick DG. Consumer goal structures and gold determination processes: An ıntegrative framework. in Ratneshwar S, Mick DG, Huffman C. The why of consumption: contemporary perspectives on consumer motives, goals, and desires, routledge, London & New York, 2000.
35. Hugenberg B. Communicatively constructed stakeholder ıdenity: A critical ethnography of cleveland browns fan culture. Unpublished Doctoral Dissertation, Bowling Green: Bowling Green State University, 2002.
36. Hunt KA, Bristol T, Bashaw ER. A Conceptual approach to classifying sports fans. Journal of Services Marketing, 1999; vol. 13,6, 439-452.
37. İlk Ç, Çavuşoğlu SÇ, Güler C. Futbol taraftarlarının fanatiklik ve lisanslı ürün satın alma düzeylerinin incelenmesi. Uluslararası toplum araştırmaları dergisi, 2020; 10,16.
38. James JD. Becoming a sports fan: Understanding cognitive development and socialization in the development of fan loyalty, Doctoral dissertation, The Ohio State University, 1997.
39. Jöreskog KG, Sörbom D. LISREL 8: Structural equation modeling with the SIMPLIS command language. Scientific Software International,1993.
40. Kazan B. Türkiye'de Futbol Fanatizm ve Şiddet, Mimar Sinan Güzel Sanatlar Üniversitesi, Sosyal Bilimler Enstitüsü, Yüksek Lisans Tezi, 2009; 103 sayfa, İstanbul
41. Kline RB. Convergence of structural equation modeling and multilevel modeling, 2011.
42. Kosiewicz J. Professional, spectator, and olympic sports in the context of the terms spiritualism and spirituality, and in the context of normative ethics. Physical Culture and Sport, 2015; 68(1), 43.
43. Kurak K. Lise öğrencilerinin futbol fanatiklik düzeylerinin incelenmesi. Germenica Beden Eğitimi ve Spor Bilimleri Dergisi, 2020; 1,1.
44. Laverie DA, Arnette DB. Factors affecting fan attendance: the influence of identity Salience and Satisfaction. Journal of Leisure Research, 2000; 32 (2),225-246.
45. McAlexander JH, Schouten JW, Koenig HF. Building brand community. Journal of marketing, 2002; 66(1), 38-54.
46. Mullin BJ, Hardy S, Sutton WA. Sport marketing (2nd ed.). Champaign, IL: Human Kinetics, 2000.
47. Muniz AM, O'guinn TC. Brand community. Journal of consumer research, 2001; 27(4), 412-432.
48. Oliver RL. Whence consumer loyalty?. Journal of marketing, 1999; 63(4_suppl1), 33-
49. Oxford Latin Dictionary. Oxford: Clarendon Press, 1968.

50. Pimentel RW, Reynolds KE. A model for consumer devotion: Affective commitment with proactive sustaining behaviors. Academy of Marketing Science Review, 2004; 1.
51. Pooley J. The sport fan: A social psychology of misbehaviour. Calgary: CAPHER Sociology of Sport Monograph Series, 1978.
52. Raney AA. (2013). Reflections on communication and sport: On enjoyment and disposition. Communication & Sport, 2013; 1, 162–175.
53. Redden J, Steiner CJ. Fanatical consumers: towards a framework for research. Journal of consumer marketing, 2000.
54. Rifkin G, (1999) How the red sox touch all the branding bases. Strategy and business, 1999; 17, 75-83.
55. Rozanski HD, Baum AG, Wolfsen BT. Brand zealots: realizing the full value of emotional brand loyalty. Strategy business, 1999; vol. 17, pp. 51-62.
56. Salkind NJ. Encyclopedia of research design, 2010; (Vol. 1). Sage.
57. Shank MD, Beasley FM. Fan or Fanatic: refining measure of sports involvement', Journal of Sports Behaviour, 1998; 21, 435-443.
58. Romani S, Sadeh H, Dalli D. When the brand is bad, I'm mad! An exploration of negative emotions to brands. ACR North American Advances, 2009.
59. Steiger JH. Understanding the limitations of global fit assessment in structural equation modeling. Personality and Individual Differences, 2007; 42(5), 893-898.
60. Sümer N. Yapisal eşitlik modelleri: Temel kavramlar ve örnek uygulamalar. Türk Psikoloji Yazilari,2000.
61. Tanyeri L. (2019). Futbol taraftarı fanatiliği: Üniversite öğrencileri örneği. Spor Eğitim Dergisi, 2019; 3, 2, 89-97.
62. Taşmektepligil MY, Çankaya S. Tunç T. Futbol taraftarı fanatiklik ölçeği. Spor ve Performans Araştırmaları Dergisi, 2015; 6(1), 41-49.
63. Thompson LH. Operation of pension systems: public or private, 2004. Erişim; http://www.adb.org/Documents/Books/Social_Protection/chapter_06.pdf.
64. Vallerand RJ, Mageau GA, Elliot A, Dumais MA, Demers M, Rousseau FL. Passion and performance attainment in sport. Psychology of Sport and Exercise, 2008; 9, 373–392.
65. Wann DL, Melnick MJ, Russell GW, Pease DG. Sport fans: The psychology and social impact of spectators. Routledge, 2001.
66. Wann DL, Schrader MP, Adamson DR. The cognitive and somatic anxiety of sport spectators. Journal of Sport Behavior, 1998; 21(3), 322.
67. Webster C. Toward the measurement of the marketing culture of a service firm. Journal of business research, 1993; 21(4), 345-362.
68. Whang YO, Allen J, Sahoury N, Zhang H, (2004) Falling in love with a product: The structure of a romantic consumer-product relationship. Advances in Consumer Research, 2004; 31, 320-327.

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Exercise and Lymphatic System

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Abstract

The human body has two main circulatory systems, the blood and lymphatic systems. Although both systems share many functional, structural and anatomical similarities, the two vascular systems have many differences in science and medicine. Although the blood vascular system has been studied extensively and extensively for a long time, the lymphatic system has been seen as secondary to the blood vascular system and has been considered less important. Although studies in this area have increased, the lymphatic system has not been a physiological system that has received great attention in the sports medicine literature, and misinformation has been derived and comments have been made about this area. The aim of this study was to reveal the effects of exercise on the lymphatic system and to explain its possible mechanisms of action.

Key words: Exercise ,Lymphatic system, Lymph node.

Özet

Egzersiz ve Lenfatik Sistem

İnsan vücudunun iki ana dolaşım sistemi vardır bunlar kan ve lenfatik sistemlerdir. Her iki sistem birçok işlevsel, yapısal ve anatomik benzerliği paylaşmış olmasına rağmen, iki vasküler sistemin bilim ve tıpta çok farklılıkları vardır. Kan vasküler sistemi uzun süre yoğun ve kapsamlı bir şekilde çalışılmış olsa da buna karşın lenfatik sistem kan vasküler sistemine ikincil olarak görülmüş, daha az önemli olarak kabul edilmiştir. Her ne kadar bu alanda çalışmalar artsa da, egzersizle ilgili olarak lenfatik sistem, spor tıbbı literatüründe büyük ilgi gören bir fizyolojik sistem olmamıştır ve bu alanla ilgili yanlış bilgiler türeyip, yorumlar yapılmıştır. Bu çalışmanın amacı egzersizin lenfatik sistem üzerine etkilerini ortaya koymak ve olası etki mekanizmalarını açıklamaktır.

Anahtar kelimler: Egzersiz, Lenfatik sistem, Lenf nodu.

INTRODUCTION

Lymphatic System

The lymphatic system consists of lymphatic tissue and lymphatic vessels. lymphatic tissue; It is a type of connective tissue containing a large number of lymphocytes and has a fundamental role in the immunological defense of the body against bacteria and viruses. It recovers excess tissue fluid through numerous microscopic vessels called lymphatic capillaries that penetrate almost all of the body's tissues (13).

Our environment is filled with countless pathogens bacteria, viruses, fungi, and other microbes that can cause disease. One of our defenses against these is the lymphatic system, a network of tissues, organs, and vessels that recover tissue fluid, clearing pathogens, activating immune responses, and returning fluid to the bloodstream. The components of the system include (a) lymph, the fluid that is collected from the tissues and returned to the bloodstream; (b) lymphatic vessels (also called mere lymphatics) that resemble veins and carry lymph; (c) lymphatic tissue consisting of deposits of lymphocytes in the connective tissues of various

organs such as the digestive and respiratory tracts; and (d) lymphatic organs, structures enclosed in a fibrous capsule and containing masses of organized lymphatic tissue (17).

The lymphatic system has three functions

Fluid recovery: The fluid constantly leaks from the blood capillaries into the tissue spaces. The blood capillaries absorb about %85 of this fluid, and the lymphatic system absorbs the other 15%. Without the lymphatic system, this %15 would lose 2 to 4 liters of water per day and a protein of up to one and a half times that of blood plasma. This individual will die quickly from the loss of blood volume and circulatory failure (13).

Immunity: Fluid recovered from body tissues is checked by the lymphatic system for toxins, microbes and other threats. The lymphatic system also maintains the openings of the digestive, respiratory and other pathways. When disease agents are detected, the immune cells of the lymphatic system are quickly mobilized to fight (13).

Lipid absorption: Special lymph vessels in the small intestine absorb dietary lipids. The lipids travel along the lymphatic vessels that eventually empty into the great left subclavian vein. From here, the bloodstream can distribute these lipids to the body for storage or immediate use (13).

Unlike blood capillaries, lymph capillaries have a wall structure that allows the passage of proteins and large molecular particles. The lymphatic capillaries are located close to the blood capillaries and are responsible for drawing the substances that leak out of the blood vessels into the lymphatic circulation (9). This fluid that enters the lymphatic vessels is called lymph. The protein content of lymph is 7gr/dl; this amount is usually lower than the plasma protein level. However, the amount of protein contained in the lymph may vary depending on the region it drains. Lymph is transported from the lymph nodes to the lymphatic trunks. The overlapping edges of endothelial cells act as valves that open and close due to pressure in the surrounding tissue fluid (17). Whenever the tissue fluid pressure is high, the flaps are pushed inward (open) and the fluid enters the lymph vessel. If the withdrawal of fluids from the spaces in the tissues into the lymphatic vessels is reduced, swelling may result due to fluid accumulation. Lymphatic capillaries join to form fine collecting vessels. These make up six lymphatic trunks, each of which drains a large part of the body. For example, the lumbar trunks drain the lumbar region and lower extremities. All lymphatic trunks merge to form only two collecting ducts, the largest lymph vessels. In total, the body has 600 to 700 lymph nodes, with the largest grouping found in the head and neck, around the intestines, axilla, and groin. As the lymph is transported through the lymphatic network, it travels through the lymph nodes where an immune response can be initiated if foreign matter is detected. Immune competent cells that follow the same pathway then return to the bloodstream (11, 13).

Features of Circulatory System and Lymphatic System

The lymphatic system is a linear network of lymphatic vessels and secondary lymphoid organs. Macroscopically, the blood vascular system is literally a circular system through which fluid (blood) leaves the heart; passes through arteries, arterioles, capillary plexus, venules and veins; and returns to the heart. In contrast, the lymphatic system consists of an extensive network of lymphatic vessels (lymphatics) that run from the head to the end of the body. This one-way transport system is a key component in maintaining normal interstitial fluid volume and protein concentration. Lymphatics transport fluid and protein against a central hydrostatic pressure gradient and against a protein concentration gradient. Lymphatic vessels also play out specific regional roles, such as the transport of fatty acids and cholesterol absorbed in the small intestinal mucosa (2,3,10). There are serious differences between circulatory vessels and lymph vessels. For example, lymph vessels are wider than blood vessels. n addition, the fluid in these vessels circulates in a narrower space, not throughout the body. In the cardiovascular system, blood is pumped from the main center and spreads throughout the body. Such a system is not used in lymph circulation (13).

Features	Blood Vessel	Lymphatic Vessel
Components	Blood, blood cells	Lymph (interstitial fluid rich in protein, fat and lipids, extra-mediated immune cells and large extracellular molecules)
Structures	Closed, circular	Open, linear
start/end locations	Heart/heart	Tissue/lymph vein connection of thoracic duct
Parts	Arteries, capillaries, venules, veins	Capillaries, anterior collectors, collecting vessels, thoracic duct, lymph nodes
Vascular Walls	Tight junctions, continuous basement membrane, pericytes or vascular smooth muscle cells	Overlapping lymphatic endothelial cells, non-tight junctions, discontinuous basement membrane, few pericytes (aggregation of lymphatic vessels has both continuous and wall cells).
Functions	Hemostasis, inflammation, leukocyte transport. barrier function. distribution for oxygen, nutrients and tissue waste.	Tissue fluid homeostasis, absorption of large molecules and lipids in the digestive tracts, transport of lymphocytes and antigen presenting cells to regional lymph nodes. transport of impaired extracellular molecules, cell debris, and lymphatic fluid

Comparison of Blood Vascular Endothelial Cells and Lymphatic Endothelial Cells (5)

Figure 1. Comparison of Blood Vascular Endothelial Cells and Lymphatic Endothelial Cells

Endothelial cells are attached to the surrounding tissue by protein filaments that protect the sac from collapsing. Unlike the endothelium of blood capillaries, the cells are not joined by tight junctions, but have large spaces between them for the passage of proteins, bacteria, and white blood cells. The movement of the skeletal muscles together with the muscles and valves in the structure of the lymphatic vessels provides circulation. The change in fluid pressure is also a driving force for lymph circulation. The fluid flow rate in the lymph vessels is about 100-500 times less than the blood flow rate (16).

After lymph formation, lymph begins to be drawn from the lymph capillaries towards the lymph collecting lymphatics. Since lymphatic vessels do not have a central pump like the circulatory system, their one-way valves prevent backward flow while supporting lymph transport. Collecting lymphatic vessels can be called prenodal or postnodal (afferent and efferent) (16)

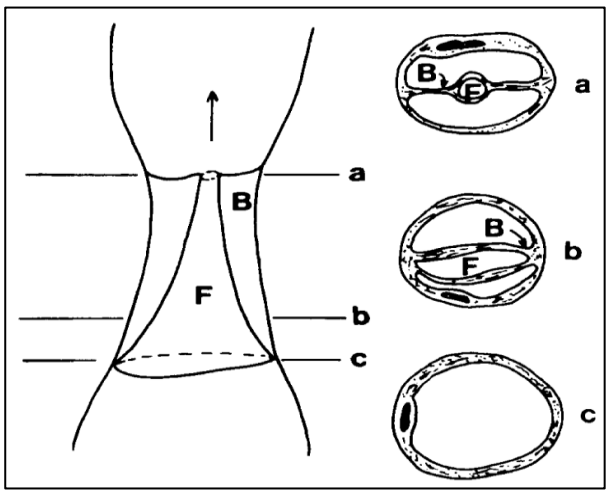

Figure 2. Lymphatic Valve System (16).

Lymph Nodes

Lymph nodes; They are small bean-shaped formations formed from lymph tissue. All collecting lymphatic vessels pass through these lymph nodes, which are capsular and arranged in clusters throughout the lymphatic system. There are hundreds of lymph nodes in the adult human body and vary in diameter from 1 to 10 mm. Lymph nodes act as filters and reservoirs. In addition, lymph nodes act as an incubator where white blood cells (sometimes tumor cells) proliferate while in the lymph nodes and reach the endothelial veins via blood. Also, the white cells in the nodes digest and destroy foreign and harmful molecules and particles. This contributes to lymph node protein dilution with fluid exchange with lymphatic vessels (1, 15).

Lymphatic System In Exercise

The main role of the lymphatic system during exercise is to reintroduce leaked fluids and plasma proteins into the cardiovascular system. Approximately 2-3 litres of fluid is returned to the blood by the lymphatics over a 24-hour period. Since the lymphatic vessels are the only way to return fluids and plasma proteins to the blood, it is unthinkable for the cardiovascular system to continue without the lymphatic system (12). Studies on lymphatic formation and transport of exercise have been studied directly on animals using cannulation of the lymphatic duct. In a study on sheep, an increase in the contraction of lymphatic vessels was observed after a short walk (approximately eight steps) and the flow rate in the lymphatic vessels doubled. 1-5 minutes after the start of the movement, the flow rate decreased to the

levels before the start of walking (14). Movement is known to increase lymph formation, but it is thought that this interaction is not directly due to the acceleration of lymph flow (14).

Coates et al. (6) examined how the lymphatic system in the hind legs of a sheep was affected after 2 hours of exercise. At the beginning of the exercise, the 15-minute constant exercise lymph flow rate increased 5 times compared to the resting flow. It was then gradually decreased and stabilized to 130% of the initial flow rate over a 30 minutes period. It is thought that the reason for the great increase in lymph flow rate is the increase in pressure in the working muscles and the lymphatic mobility caused by the increased sympathetic system. The combination of a larger vascular surface area and higher hydrostatic pressure likely contributed to the steady-state lymph flow values observed at 90–120 min of exercise (6).

Few studies have been conducted to examine the role of the lymphatic system in exercise. Havas et al. (8) investigated the effect of dynamic and isometric muscle contraction on lymph flow using lymphoscintigraphy. Lymph clearance (clearance of lymph from plasma per unit time) was measured in the legs of four sedentary men and four endurance-trained men (each leg was counted as an independent observation; therefore, n = 8 per group). In the study, different exercise models were applied as 100 repetitions at 65-minute intervals. The first of the exercise models are dynamic knee extension, and the other is isometric knee flexion and extension. The highest lymphatic flow in the study was found to be significantly higher in dynamic and isokinetic exercises. In addition, the lymphatic system clearance rate was found to be twice as high in those who had endurance training during the 65-minute rest break. The possible reason for this is the increased density of capillaries that adapt to long-term endurance training. The increase in capillary density provides a large surface area for vessel conduction and capillary filtration. If only the high capillary density had increased the rate of lymph clearance, the difference in rest would have been expected to occur in exercise. However, there was no significant difference between the groups in terms of lymph clearance during exercise. In addition, the fact that the rates in the first part of the 10-15 minute exercises (6, 7). increase 5 times and then go down to the stadium-stay and still 2-3 times more are not associated with the training level of the individuals.

Havas et al. (7) used lymphoscintigraphy to follow the lymph flow dynamics of the lower extremity for 2 hours at the steady-state level at 70% of the heartbeat. Similar to the results of this study, Coates et al. (6) increased the lymph clearance 5 times in the first 15 minutes of the exercise and the lymph clearance remained constant at 2-3 times the rest of the 2-hour load. Arterial pressure and cardiac outputs were significantly increased in the applied studies, resulting in higher capillary filtration in these factors. Increased capillary filtration may have caused an increase in interstitial pressure, which may have led to the entry of fluids and proteins in the interstitial space into lymph capillaries (4). In addition to these factors, it is known that internal and external factors affect the lymphatic velocity through lymphatic vessels (13).

CONCLUSION

To summarize the role of the lymphatic system in exercise, studies have found differences between exercise and rest. However, to the authors knowledge ,there are no studies comparing the effects of the lymphatic system in exercise according to gender or age factors. The studies are generally done in the lower body, so it is not clear what kind of lymph clearance the studies to be done in the upper body will cause. It is stated that the functioning of the lymphatic system is not clear according to important training elements such as the intensity and length of the exercise. Studies have examined the lymphatic systems of individuals doing endurance training, but it is not clear how it will differ according to other types of training. In the future studies, different exercise models and intensity can be examined in terms of lymphatic system.

Conflicts of Interest

The authors declare no conflict of interest.

REFERENCES

1. Adair TH, and Guyton AC. Lymph formation and its modification in the lymphatic system. In "Experimental Biology of the Lymphatic Circulation"(MG Johnston, Ed.) 1985.
2. Alitalo K, Carmeliet P. Molecular mechanisms of lymphangiogenesis in health and disease. Cancer Cell. 2002; 1: 219–227.
3. Alitalo K. Growth factors controlling angiogenesis and lymphangiogenesis. Ugeskr Laeger. 2002; 164: 3170–3172.
4. Aukland K, and Reed RK. Interstitial-lymphatic mechanisms in the control of extracellular fluid volume. Physiological reviews, 1993; 73(1), 1-78.
5. Choi I, Lee S ve Hong YK. The new era of the lymphatic system: no longer secondary to the blood vascular system.

Cold Spring Harbor perspectives in medicine, 2012; 2(4), a006445.
6. Coates G, O'Brodovich H, Goeree G. Hindlimb and lung lymph flows during prolonged exercise J Appl Physiol, 1993; 75 (2): 633-8
7. Havas E, Lehtonen M, Vuorela J, Parviainen T, & Vihko V. Albumin Clearance from Human Skeletal Muscle During Prolonged Steady-State Running. Experimental physiology, 2000; 85(6), 863-868.
8. Havas E, Parviainen T, Vuorela J, Toivanen J, Nikula T, & Vihko V. Lymph flow dynamics in exercising human skeletal muscle as detected by scintography. The Journal of physiology, 1997; 504(1), 233-239.
9. Hetrick H. Lymphedema complicating healing. In McCulloch, JM, and Kloth, LC (eds): Wound Healing: Evidence-Based Management, ed. 4. Philadelphia: FA Davis, pp 279–291. 2010.
10. Karkkainen MJ, Makinen T, Alitalo K. Lymphatic endothelium: A new frontier of metastasis research. Nat Cell Biol, 2002; 4: E2–E5.
11. Kisner C, Colby LA, Borstad J. Therapeutic exercise: Foundations and techniques. Fa Davis.2017
12. Krasnow AZ, Hellman RS. Lymphoscintigraphy revisited. In: Freeman LM, editor. Nuclear medicine annual. Philadelphia (PA): Lippincott, Williams & Wilkins 17-97, 1999.
13. Lane K, Worsley D, & McKenzie D. Exercise and the lymphatic system. Sports medicine, 2005; 35(6), 461-471.
14. McGeown JG, McHale NG, & Thornbury KD. The role of external compression and movement in lymph propulsion in the sheep hind limb. The Journal of physiology, 1987; 387(1), 83-93.
15. Schmid-Scho¨nbein GW.. Microlymphatics and lymph flow, Physiol. Rev. 1990; 70 987–1028.
16. Swartz MA.. The physiology of the lymphatic system. Advanced drug delivery reviews, 2001; 50(1-2), 3-20.
17. Zawieja, DC. Proceedings of a mini-symposium: Lymphedema— an overview of the biology, diagnosis, and treatment of the disease (contractile physiology of lymphatics). Lymphatic Research & Biology 2009; 7(2):87.

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Comparison of Plasma NPY and Zinc Levels of Elite Weightlifters and Sedentaries*

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Abstract

Neuropeptide Y (NPY), a strong stimulant of nutrition, and zinc, which has an important effect on nutrition regulation, have attracted the attention of many researchers. The aim of this study was to investigate the relationship between plasma NPY and zinc levels in elite weightlifters. Thirty healthy subjects between the ages of 18-27 participated in the study voluntarily. The subjects were composed of two equal groups: the control group who did not exercise regularly and the elite weightlifters who did regular training. Plasma NPY (ELISA) and zinc levels (Atomic Absorption Spectrophotometer) were determined in blood samples collected from subjects. Statistical evaluation of the data was performed using Minitab for Windows, Release 13.0 computer software. Arithmetic means and standard deviations of all parameters were calculated. Variance analysis was used to determine the differences between groups. The Least Significant Difference Test (LSD) was employed to compare group means obtained from the variance analyses that were found statistically significant. When serum NPY and zinc values were compared between the groups, it was found that NPY levels of elite weightlifters were higher than controls ($p < 0.01$) and zinc levels were lower ($p < 0.01$). The findings of the study show that physical activity leads to changes in NPY and zinc release. As a result, there may be a critical relationship between these changes and physical performance.

Keywords: Elite Weightlifter, Sedentary, NPY, Zinc

Elit Haltercilerle Sedanterlerin Plazma NPY ve Çinko Düzeylerinin Karşılaştırılması

Özet

Beslenmenin kuvvetli bir uyarıcısı olan nöropeptid Y (NPY) ile beslenmenin düzenlenmesinde önemli bir etkiye sahip olan çinkonun bir arada egzersizle ilişkisi birçok araştırıcının dikkatini çekmiştir. Bu çalışmanın amacı elit haltercilerde plazma NPY ve çinko düzeyleri arasındaki ilişkinin araştırılmasıdır. Çalışmaya 18-27 yaş aralığında 30 sağlıklı denek gönüllü katılmıştır. Denekler düzenli egzersiz yapmayan kontrol grubu ve düzenli antrenman yapan elit halterciler olmak üzere eşit sayıda iki gruba ayrıldı. Deneklerden toplanan kan örneklerinde plazma NPY (ELISA) ve çinko düzeyleri (Atomik Absorpsiyon Spektrofotometresi) tayin edildi. Verilerin istatistiksel değerlendirmesi Minitab for Windows, Sürüm 13.0 bilgisayar yazılımı kullanılarak yapıldı. Tüm parametrelerin aritmetik ortalamaları ve standart sapmaları hesaplandı. Gruplar arasındaki farklılıkları belirlemek için varyans analizi kullanıldı. İstatistiksel olarak anlamlı bulunan varyans analizlerinden elde edilen grup ortalamalarını karşılaştırmak için Asgari Önemli Fark Testi (AÖF) kullanıldı. Serum NPY ve çinko değerleri gruplar arasında mukayese edildiğinde elit haltercilerin NPY düzeylerinin kontrollerinden yüksek ($p<0.01$), çinko düzeylerinin ise düşük bulunduğu tespit edilmiştir ($p<0.01$). Çalışmanın sonucunda elde edilen bulgular, fiziksel aktivitenin NPY ve çinko salınımında değişikliklere yol açtığını göstermektedir. Sonuç olarak bu değişiklikler ile fiziksel performans arasında kritik bir ilişkinin olabileceği söylenebilir.

Anahtar kelimeler: Elit Halterci, Sedanter, NPY, Çinko

INTRODUCTION

Neuropeptide Y (NPY) is a neuratransmitter or neuromodulator peptide consisting of 36 amino acids (7). The most well-known effects of neuropeptide Y are on nutrition. These effects are seen by central NPY injection in the hypothalamus and are involved in normal or pathological changes of appetite (30). In humans, NPY has been reported to be released from the circulation in response to sympathetic activation with a range of stimuli such as hypoglycemia, exercise, and acute stress. In addition, NPY and its receptors are known to be released from the central nervous system, many brain regions, spinal cord and especially the sympathetic nervous system (30,19).

NPY, which plays a leading role in regulating eating behavior and energy expenditure by reducing physical activity, leads to a decrease in motor activity, heart rate and blood pressure (24). However, there is limited evidence of NPY's responses to exercise. Karamouzis et al. (12) reported an increase in NPY values in response to marathon swimming exercises. Chen et al. (3) stated that NPY levels in mice continued to increase after exercise and this situation was statistically significant. It has been reported that high-intensity combined training applied to elite rowers significantly increases NPY levels (18). In another study to determine NPY levels in obese young men, it was reported that the increase in NPY levels after a single session of 30 minutes cycling exercise may be a triggering factor for the stimulation of consumed food (9).

Zinc, which has physiological functions such as growth, reproduction and immunity, is important for all living creatures and plays a role in the regulation of appetite. Zinc, the essential trace metal in the body, is a trace element that has several roles in important physiological processes as a signaling molecule. Changes in the concentration of neurotransmitters that occur at the hypothalamic level in general or locally due to changes in zinc levels cause a change in food intake (26,11). Zinc deficiency has been reported to cause various physiological problems such as loss of appetite, low body mass, anorexia, growth retardation, dermatitis, taste disorder and hypogonadism (26,11,25). Since zinc mediates the action of many hormones or is involved in the structure of numerous hormone receptors, zinc deficiency causes various functional impairment in hormone balance and the physiological and biochemical levels of many hormones are affected by zinc metabolism (15,22).

There are almost no studies on the relationship between NPY, which plays a pioneering role in the regulation of eating behavior and energy expenditure by reducing physical activity, and zinc, which have an important role in regulating appetite, with exercise. This study was performed to determine plasma NPY and zinc levels in elite weightlifters and to investigate their relationship with exercise.

MATERIAL AND METHOD

The subjects: Thirty healthy volunteers aged 18-27 participated in the study. Subjects were divided into 2 groups:

Group 1 (n=15), control group: The subjects of this group consisted of volunteer students from the School of Physical Education and Sports who did not train regularly.

Group 2 (n=15), experimental group: A group of elite weightlifters whose weight was selected for the national team, exercising regularly and taking measurements at rest during the camp.

All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki.

Biochemical measurements:

Plasma Neuropeptide Y Analysis and Measurements: The analyses were carried out using Ray Bio NPY ELISA test kit (EIA-NPY). Values were read at 450 nm with BMG-LABTECH brand SPECTRO Star Nano Elisa Device (Germany). The values were calculated as pg/dl.

Plasma zinc measurements: Blood samples (2ml) collected from the subjects and put into heparinized tubes were centrifuged to separate plasma. The separated plasma was put into plastic-cap tubes and kept at -200C until analysis. Plasma zinc levels were determined in a Shimatsu ASC-600 model Atomic Absorption Spectrophotometer located in the Biochemistry Department of Elazig Firat University Medical School.Zinc levels were determined as μg dl-1.

Statistical Analysis:

Statistical evaluation of the data was performed using Minitab for Windows, Release 13.0 computer software. Arithmetic means and standard deviations of all parameters were calculated. Variance analysis was used to determine the differences between groups. The Least Significant Difference Test (LSD) was employed to compare group means obtained from the variance analyses that were found statistically significant.

RESULTS

Table 1. Serum NPY and zinc values of subjects

Group	NPY (pg/dl)	Zinc (µg/dl)
Control (n=15)	115.41 ± 11.26^{A}	127.10 ± 18.50^{A}
Elite Weightlifter (n=15)	133.12 ± 13.55^{B}	89.55 ± 13.70^{B}
p	0.01*	0.01*

*In the same column, the difference between the means with different letters is statistically significant ($p < 0.01$).

In Table 1, NPY levels of elite weightlifters were found to be significantly higher than the control group ($p < 0.01$). In contrast, serum zinc levels of the control group were significantly higher than elite weightlifters ($p < 0.01$).

DISCUSSION AND CONCLUSION

In this study, when NPY and zinc values were compared between the groups, it was found that NPY levels of elite weightlifters were higher than controls and zinc levels were lower. Many researchers have emphasized the relationship between nutrition, development and maintenance of performance. Two methods are often used to determine the interaction between physical activity and nutrition. The first of these is to examine the physiological and performance responses by giving nutrients with different contents to the participants in the physical activity and to determine the effects of physical activity on nutrition (28). Therefore, it can be said that there is an increasing interest in investigating the relationship between exercise and minerals and elements (17).

There is little information about the effects of zinc, which is known to be an important trace element in energy metabolism, on performance. Studies on the relationship between zinc and exercise mostly focus on the distribution of this element in the body in response to exercise (16,4). There are few studies on the relationship between NPY, which is a strong stimulant of nutrition, and zinc, which have a significant effect on the regulation of nutrition, and exercise. There is a significant relationship between zinc and NPY regulation during anorexia caused by zinc deficiency (25). It has been reported that zinc deficiency contributes to the symptoms of anorexia nervosa and that the diet must contain an adequate amount of zinc to recover normal body weight during recuperation (20). Selvais et al. (21) showed that NPY mRNA increased in hypothalamus in zinc-deficient rats, but this increase in NPY levels could not be determined. Lee et al. (14) found that there was a 100% increase in NPY mRNA and a 50% increase in NPY levels in zinc deficiency. Marginal zinc deficiency has been reported to cause as low body mass as anorexia (23,8,27). Baltacı and Mogulkoç (1) found that NPY values were high in hypothyroidism and hyperthyroidism + zinc deficient groups in their study to investigate the effect of zinc supplementation and some hormones on thyroid dysfunction in rats. In addition to this study, hypo and hyperthyroidism groups have higher serum NPY values compared to the control group. No studies have reported a decrease in NPY levels in zinc deficiency (23). Despite increased NPY levels in zinc deficiency, this decrease in nutrition is defined as NPY resistance. The reasons causing this resistance; It is thought that pro-NPY may be related to deterioration in conversion to active NPY, decreased NPY secretion from neurons, and a decrease in NPY signaling (21,14,23). In our study, high NPY levels of elite weightlifters were probably higher than controls, possibly due to a decrease in zinc levels.

In our study, serum zinc levels of elite weightlifters (group 2) were found to be significantly lower compared to the control group. Long-term endurance training has been shown to significantly reduce serum zinc levels in both male and female athletes (10). The reduced zinc levels obtained in our study are consistent with the findings of Haralambie (10). The reduced zinc levels observed in endurance athletes can be explained by various mechanisms. However, the most important reason may be related to malnutrition from zinc (13). In addition, sweat and skin and zinc loss in athletes is known to be more than the non-athlete population (2). It is stated that moderate exercise increases the loss of zinc by sweat in athletes, but these losses may be higher in men than in women when the amount

of sweating is taken into consideration (29). This phenomenon may be related to increased urinary loss of zinc as a result of skeletal muscle protein degradation observed in regular training athletes. Cordova and Alvarez (5) reported that as a result of the low serum concentration observed in athletes, the concentration of muscle zinc is also reduced. Since zinc is essential for many enzymes involved in metabolism, severe zinc deficiency will adversely affect muscle function. As a result, low muscle zinc levels will also reduce endurance capacity (6).

The most important event to be emphasized in our study is the decrease in serum zinc levels of elite weightlifters. Exercise zinc metabolism or zinc has important effects on exercise (16,4). The necessity of zinc for the activity of certain enzymes in energy metabolism and the reduction of muscle zinc levels in exercise may cause a decrease in endurance capacity, leading to muscle fatigue. In particular, the relationship between fatigue and zinc in exercise appears to be an issue that needs to be emphasized.

As a result of the study, it was determined that zinc levels were significantly lower in the individuals doing weightlifting exercises compared to the controls, and NPY levels increased significantly in parallel with the low zinc levels. It can be concluded that physical activity causes changes in NPY secretion and there may be a significant relationship between these changes and zinc. Especially in elite weightlifters, it can be suggested that physiological dose of zinc may be beneficial on performance due to the low serum zinc levels observed when compared with the control group.

REFERENCES.

1. Baltaci AK, Moğulkoc R. Leptin, NPY, melatonin and zinc levels in experimental hypothyroidism and hyperthyroidism: The relation to zinc. Biochem Genet, 2017; 55: 223-233, https://doi.org/10.1007/s10528-017-9791-z.
2. Campbell WW, Anderson RA. Effects of aerobic exercise and training on the trace minerals chromium, zinc and copper. Sports Med, 1987; 4: (1): 9-18, https://doi.org/10.2165/00007256-198704010-00002.
3. Chen JX, Zhao X, Wang ZF. Infuence of acute and chronic treadmill exercise on rat plasma lactate and brain NPY, L-ENK, DYN A1–13. Cell Mol Neurobiol, 2007; 27:1-10, https://doi.org/10.1007/s10571-006-9110-4.
4. Chu A, Petocz P, Samman S. Plasma/serum zinc status during aerobic exercise recovery: a systematic review and meta-analysis. Sports Med, 2017; 47(1): 127-134, https://doi.org/10.1007/s40279-016-0567-0.
5. Cordova A, Alvarez-Mon M. Behaviour of zinc in physical exercise, a special reference to immunity and fatigue. Neurosci Biobehav Rev, 1995; 19: 439-445, https://doi.org/10.1016/0149-7634(95)00002-V.
6. Cordova A, Navas FJ. Effect of training on zinc metabolism: changes in serum and sweat zinc concentrations in sportsmen. Ann Nutr Metab, 1998; 42 (5): 274-282.
7. Diaz-delCastillo M, Woldbye DPD, Heegaard AM. Neuropeptide Y and its involvement in chronic pain. Neuroscience, 2018;387:162-169. https://doi.org/10.1016/j.neuroscience.2017.08.050
8. El-Shazly AN, Ibrahim SA, El-Mashad GM, Sabry JH, Sherbini NS. Effect of zinc supplementation on body mass index and serum levels of zinc and leptin in pediatric hemodialysis patients. Int J Nephrol Renovasc Dis, 2015; 8: 159-163, https://doi.org/ 10.2147/IJNRD.S94923.
9. Faraji H, TaghipoorAsrami A, Jalali SF, Enferadi F. The effect of concurrent exercise on PYY and NPY plasma levels in obese men. Tabari J Preventive Med, 2016; 2(1): 48-58.
10. Haralambie G. Serum zinc in athletes in training. Int J Sports Med, 1981;2(3):135-138, https://doi.org/10.1055/s-2008-1034599.
11. Huang L, Li X, Wang W, Yang L, Zhu Y. The role of zinc in poultry breeder and hen nutrition: an update. Biol Trace Elem Res, 2019; 192 (2): 308-318, https://doi.org/10.1007/s12011-019-1659-0.
12. Karamouzis I, Karamouzis M, Vrabas IS, Christoulas, K, Kyriasis N, Giannoulis E, Mandroukas K. The effects of marathon swimming on serum leptin and plasma neuropeptide Y levels. Clin Chem Lab Med, 2002;40:132-136, https://doi.org/10.1515/CCLM.2002.023.
13. Khaled S, Brun JF, Cassanas G, Bardet I, Orsetti A. Effects of zinc supplementation on blood rheology during exercise. Clin Hemorheol Microcirc, 1999; 20(1): 1-10.
14. Lee RG, Rains TM, Tovar-Palacio C, Beverly JL, Shay NF. Zinc deficiency increases hypothalamic neuropeptide Y and neuropeptide Y mRNA levels and does not block neuropeptide Y-induced feeding in rats. J Nutr 1998; 128:1218-1223, https://doi.org/10.1093/jn/128.7.1218.
15. Li YV. Zinc and insulin in pancreatic beta-cells. Endocrine, 2014;45(2):178-189, https://doi.org/10.1007/s12020-013-0032-x.
16. Maynar M, Muñoz D, Alves J, Barrientos G, Grijota FJ, Robles MC, Llerena F. Influence of an acute exercise until exhaustion on serum and urinary concentrations of molybdenum, selenium, and zinc in athletes. Biol Trace Elem Res, 2018; 186 (2): 361-369, https://doi.org/10.1007/s12011-018-1327-9.
17. McClung JP. Iron, zinc and physical performance. Biol Trace Elem Res, 2019;188(1):135-139, https://doi.org/10.1007/s12011-018-1479-7.
18. Ramson R, Jürimae J, Jürümae T, Maestu J. The effect of 4-week training priod on plasma neuropeptide Y, leptin and ghrelin responsen in male rowers. Eur J Appl Phsiol, 2012;112:1873-1880, https://doi.org/10.1007/s00421-011-2166-y.
19. Ruegsegger GN, Speichinger KR, Manier JB, Younger KM, Childs TE, Booth FW. Hypothalamic Npy mRNA is correlated with increased wheel running and decreased body fat in calorie-restricted rats. Neurosci Lett, 2016; 618:83-88, https://doi.org/10.1016/j.neulet.2016.02.037.
20. Safai-Kutti S. Oral zinc supplementation in anorexia nervosa. Acta Psychiatr Scand Suppl, 1990; 361:14-17.
21. Selvais PL, Labuche C, Nguyen XN, Ketelslegers JM, Denef JF, Maiter DM. Cyclic feeding behaviour and changes in hypothalamic galanin and neuropeptide Y gene expression induced by zinc deficiency in the rat. J Neuroendoc, 1997; 9: 55-62, https://doi.org/10.1046/j.1365-2826.1997.00566.x.

22. Severo JS, Morais JBS, de Freitas TEC, Andrade ALP, Feitosa MM, Fontenelle LC, de Oliveira ARS, Cruz KJC, do Nascimento Marreiro D. The role of zinc in thyroid hormones metabolism. Int J Vitam Nutr Res, 2019;89;1(2): 80-88, https://doi.org/10.1024/0300-9831/a000262.
23. Shay NF, Mangian HF. Neurobiology of zinc-influenced eating behavior. J Nutr, 2000;130:1493-1499, https://doi.org/10.1093/jn/130.5.1493S.
24. Shin MS, Kim H, Chang HK, Lee TH, Jang MH, Shin MC, Lim BV, Lee HH, Kim YP, Yoon JH, Jeong G, Kim, CJ. Treadmill exercise suppresses diabetes induced increment of neuropeptide Y expression in the hypothalamus of rats. Neurosci Lett, 2003; 346:157-160, https://doi.org/10.1016/S0304-3940(03)00537-8.
25. Suzuki H, Asakawa A, Li JB, Tsai M, Amitani H, Ohinata K, Komai M, Inui A. Zinc as an appetite stimulator-the possible role of zinc in the progression of diseases such as cachexia and sarcopenia. Recent Pat Food Nutr Agric, 2011; 3(3): 226-31.
26. Swain PS, Rao SBN, Rajendran D, Dominic G, Selvaraju S. Nano zinc, an alternative to conventional zinc as animal feed supplement: A review. Anim Nutr,2016;2(3):134-141, https://doi.org/10.1016/j.aninu.2016.06.003.
27. Tannhauser, PP. Anorexia nervosa: a multifactorial disease of nutritional origin?, Int J Adolesc Med Health, 2002;14(3): 185-191, https://doi.org/10.1515/IJAMH.2002.14.3.185.
28. Thomas DT, Erdman KA, Burke LM. Position of the academy of nutrition and dietetics, dietitians of Canada and the American college of sports medicine: Nutrition and athletic performance. J Acad Nutr Diet, 2016; 116(3): 501-528, https://doi.org/10.1016/j.jand.2015.12.006.
29. Tipton K, Green NR, Haymes EM, Waller M. Zinc loss in sweat of athletes exercising in hot and neutral temperatures. Int J Sports Med, 1993; 3(3): 261-271, https://doi.org/10.1123/ijsn.3.3.261.
30. Zhang W, Cline MA, Gilbert ER. Hypothalamus-adipose tissue crosstalk: neuropeptide Y and the regulation of energy metabolism. Nutr Metab,2014; 10: 11-27. https://doi.org/10.1186/1743-7075-11-27.

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Examination of Lower and Upper Extremity Isokinetic Strength Parameters and Speed Performance of Water Polo Athletes

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Abstract

The aim of this study is to examine the relationship between the isokinetic lower and upper extremity parameters andspeed performance of water polo athletes aged 15-17.Ten elite male water polo players, aged 15-17, voluntarily took part in the study. Right and left shoulder internal / external rotator, right and left knee flexion/extension isokinetic force measurements (60° sec-1and 180° sec-1) and 25m swimming speed measurements were measured. Linear regression analysis was used to analyze the data, p <0.05 was taken as a significance level. As a result of the analysis of the obtained data, between 25m and 60° right and 60° left knee extension and knee flexion values (F (4,9) = .51, p> .05, R2 = -. 28) and 180° right and left knee extension and knee flexion, there was no statistically significant difference (F (4,9) = 1.26, p> .05, R2 = .50). Furthermore, no statistically significant difference was found between the external and internal rotation values of 25m and 60 ° right and left shoulder and external and internal rotation of the right and left shoulders 180 ° (F (4.9) = 2.63, p> .05, R2 = .68).As a result, it is thought that the major force that draws the fluid during swimming is provided by the arm and shoulder muscles, while the leg muscles play a supporting role. In addition, it is thought that water polo players' body, arm and shoulder muscles need higher energy and force requirements during swimming than pelvic and leg muscles are an important factor for performance. Therefore, it is supported by the view that the upper extremity muscles of elite water polo players can be trained at a higher level than lower extremity muscles.It can be suggested that lower and upper extremity strength exercises should be included more in the training programs of water polo athletes.

Keywords: Force, Isokinetic strength, Speed, Water polo.

Su Topu Sporcularının Alt ve Üst Ekstremite İzokinetik Kuvvet Parametreleri İle Sürat Performansının İncelenmesi

Özet

Bu çalışmanın amacı; Su topu sporcularının izokinetik alt ve üst ekstremite parametrelerinin sürat performansı ile ilişkinin incelenmesidir. Çalışmaya 15-17 yaş arası, 10 elit erkek su topu oyuncusu gönüllü olarak katıldı. Sporcuların sağ ve sol omuz internal/eksternalrotator, sağ ve sol diz fleksiyon/ekstantionizokinetik kuvvet ölçümleri (60° ve 180°açısal hız) ve 25 metre yüzme sürat ölçümleri yapıldı. Verilerin analizinde linear regresyon analizi kullanıldı, anlamlılık düzeyi olarak p.05, R2=-.28) ve 180°açısal hız sağ ve sol diz ekstansiyon ve fleksiyon, arasında istatistiksel olarak anlamlı fark tespit edilmemiştir (F(4,9)= 1.26, p>.05, R2= .50). Ayrıca sporcuların 25m ile 60°açısal hız sağ ve sol omuz eksternal ve internal rotasyon değerleri ile 180° açısal hız sağ ve sol omuz eksternal ve internal rotasyon arasında istatistiksel olarak anlamlı fark tespit edilmemiştir (F(4,9)= 2.63, p>.05, R2=.68). Sonuç olarak yüzme sırasında akışkan biyomekaniğinin çekici gücü kol ve omuz kaslar tarafından sağlandığı, diz kaslarının ise destekleyici rol oynadığı düşünülmektedir. Ayrıca su topu sporcularının gövde, kol ve omuz kaslarının pelvik ve diz kaslarına göre yüzme sırasındaki enerji ve kuvvet gereksiniminin daha fazla olması performans için önemli bir etken olduğu düşünülmektedir. Bu nedenle elit su topu oyuncularının üst ekstremite kaslarının alt ekstremite kaslarına oranla daha yüksek seviyede antrene olabildikleri görüşünü desteklemektedir. Su topusporcularının antrenman programlar içindealt ve üst ekstremitekuvvet çalışmalarının daha çok yer verilmesi önerilibilir.

Anahtar Kelimeler: Su topu, İzokinetik, Sürat, Kuvvet

INTRODUCTION

Water polo includes explosive loads of less than 15 seconds and repetitive activities of varying intensity, combining high-intensity and short-duration actions. It is also a sports branch in which technical and tactical skills and biomotor features are used extensively(1). Water polo players perform actions consisting of combinations of movements such as rising, diving, blocking, sprinting, ball control and agility(2). During these actions, they use their lower and upper extremity intensively. Movements such as scissors, jumping, rotation, foot hitting for the lower extremity, and holding-pushing, block, shooting, pass and goal throw for the upper extremity are techniques that require strength and skill(3). Strength and swimming performance of water polo players and swimmers are highly correlated(4).

During water polo competition, explosive actions such as jumping, throwing against opponents are performed almost vertically rather than a horizontal swimming position in the water, and this has a significant impact on the match(5,6,7,8). Therefore, it is possible to achieve the ability to swim, push the body up and stay up with a strong scissors movement. The scissors movement consists of the circular movements of the legs and generates the force to keep the athlete above the water in a vertical position. In this movement, the knee joint participates in the action together with flexion / extension and medial / lateral rotation(9).

Isometric, concentric, eccentric and isokinetic contraction types are the main types of exercises using in the development of muscle strength(10,11). Isokinetic strength is measured by isokinetic dynamometers. The isokinetic dynamometer has a high reliability and can measure peak moment at different velocity and throughout the complete range of motion(12,13). Due to shown as a gold standard strength assessment method(17,18), isokinetic dynamometry was used in the study. Isokinetic strength outputs can show muscular force produced by athletes in the lower and upper extremity(14,15,16), relation of neuromuscular structure with sport skill, determining muscle imbalances. In addition, isokinetic strength evaluation helps in creating a training program.

It is emphasized that studies on isokinetic force and water polo are insufficient in the literature. Since force and water polo movements are highly related, the aim of our study is to examine the relationship between the isokinetic lower, upper extremity parameters, and speed performance of water polo athletes (students) aged 15-17.

MATERIALS AND METHODS

Participants

The sample group of the study consisted of 10 male athletes (age15.6 ± 0.84 years, height 176.5 ± 6.0 cm and body weight 65.4 ± 11.6 kg) playing in the Selcuklu Municipality Sports Club (also studing in different high schools) which is in the Water Polo 2nd League. Participants and their family were informed about the aim and the risks of the study. All participants' family were provided with written informed consent.The study protocol was approved by the Ethics Committee of Selcuk University, Sport Sciences Faculty (code 409900478-050.99/11237).

Research Design

Both groups were taken to the sports science faculty laboratory at 09:00 am.Athletes did not use any ergogenic aids and drugs that would affect their performance during the test. Participants were warned to not participate in any exercise in the past 48 hours until the end of the test section. Subjects were applied to a standard warm-up including stretching movements. Following that, participants were taken to isokinetic strength measurement by Cybex (Cybex NORM®, Humac, CA, USA). Firsty, all participants' shoulder isokinetic strength, then knee extension and flexion strength were measured.

Isokinetic Knee Strength Measurement

The isokinetic strength measurements of knee were performed by an isokinetic dynamometer (Cybex NORM®, Humac, CA, USA) in the kinatropometry laboratory of Selcuk University. Each Participant was given a familiarization in shoulder at 60° sec-1 for 5 repetitions(19). When the familiarization done, each participant had a 2-min rest. After the rest period, each participant was asked to perform 5 repetitions as hard and as fast as he could at a speed of 60° sec-1 and 180° sec-1. 2 minutes were given beetwen velocity differences. After the test for right shoulder was performed, each participant was given a 5-min rest, and then other shoulder strength was measured. After all the shoulder internal and external test were done, participants' knee extension and flexion were taken with the same frame.

Shoulder internal and external rotation strength were obtained from the participants in a standing

position, with elbow flexed at 90°. To measure the muscle strength of shoulder internal and external, the peak moment (Nm) done with 5 repetitions at a velocity of 60° sec-1(20) and 10repetitions180° sec-1was determined.

In the leg strength, participants were seated in the correct position in the test seat. The participants' holders and the middle sections of the thighs were stabilized to the seat by the tapes. In addition, they were allowed to brace for support by holding the handles on the right and left sides of the seat during the test. The Participants were instructed to complete a ROM from 90° to 10°. The point of the beginning was 90° of flexion, then moving into extension. To measure the muscle strength of knee extension and flexion, the peak moment (Nm) done with 5 repetitions at a velocity of 60° sec-1 and 10 repetitions180° sec-1was determined.Participants were supported by verbally encouraging expressions in order to achieve higher performance during the test(21) .

Anthropometric Measurements

In the anthropometric measurements, the height of the athletes was measured with a (HoltainLtd, UK) stadiometer and a body weight with a scale (Tanita TBF 401 / A, Japan)(22,23,24).

25 m Speed Test

The 25 m free-style swimming speed of the athletes was made by asking them to start the test by pushing the wall (sliding in the water) from the pool, without any command, when they felt ready. Casio brand stopwatch was used to determine the sprint swimming times. Athletes took the same swimming measurements for the second time after a full rest and their best scores were recorded to be evaluated in terms of "second"(25).

Statistical Analysis

It was determined by Shapiro-Wilks and Kolmogorov-Smirnov tests that the obtained data did not show normal distribution.The relationship between the speed parameters of the athletes and the isokinetic strength measurements was examined by means of Linear Regression Analysis. All statistical tests were performed using the software package SPSS version 24.0 (SPSS Inc, Chicago, IL). An alpha value of <.05 was considered being statistically significant.

Results

Table 1. Mean and Standard Deviation Values of 60 ° and 180 ° knee flexion and extension of the athletes

Variables Peak Torque (N/m)	*N*	$\bar{X}$	*Ss*
Right Knee Extension 60°	10	201.70	37.15
Right Knee Flexion 60°		101.20	21.61
Left Knee Extension 60°		207.20	46.14
Left Knee Flexion 60°		104.90	24.55
Right Knee Extension 180°		137	32.51
Right Knee Flexion 180°		63.50	13.47
Left Knee Extension 180°		141.20	29.13
Left Knee Flexion 180°		65.20	14.43

Table 2. Regression Analysis of Peak torque of athletes at 60 ° right and left knee extension and flexion with 25m speed

Modal	sd	x^2	F	p
Regression	4	1396.83	.51	.73
Differences	5	2737.71		
Total	9			

* Significant differences (P < 0.05).

When table 2 examined, no statistically significant difference was found between the athletes' 25m and the dependent variables peak torque 60 ° right and left knee extension and knee flexion values according to the results of the regression analysis (F (4,9) = .51, p> .05, R2 = -.28).

Table 3. Regression Analysis of Peak torque of athletes at 180 ° right and left knee extension and flexion with 25m speed

Modal	sd	x^2	F	p
Regression	4	2421.26	1.26	.39
Differences	5	1918.16		
Total	9			

* Significant differences (P < 0.05).

When table 3 examined, no statistically significant difference was found between the athletes' 25m and the dependent variables peak torque 180 ° right and left knee extension and knee flexion values according to the results of the regression analysis (F(4,9)= 1.26, p>.05, R2= .50).

Table 4. Mean and Standard Deviation Values of 60 ° and 180 ° shoulder external and internal rotation torque of the athletes

Variables Peak Torque (N/m)	*N*	$\bar{X}$	*Ss*
Right Shoulder External 60°	10	50	11.98
Right Shoulder Internal 60°		26.7	5.05
Left Shoulder External 60°		47.8	13.93
Left Shoulder Internal 60°		26.7	5.27
Right Shoulder External 180°		44.50	10.46
Right Shoulder Internal 180°		22.1	5.55
Left Shoulder External 180°		40.8	10.59
Left Shoulder Internal 180°		20.8	3.88

Table 5. Regression Analysis of Peak torque of athletes at 60 ° right and left Shoulder External and Internal with 25m speed

Modal	sd	x^2	F	p
Regression	4	2708.14	1.60	31
Differences	5	1688.66		
Total	9			

* Significant differences (P < 0.05).

There was no statistically significant difference between the athletes' 25m and the dependent variables peak torque 60 ° right and left shoulder external and internal values according to the results of the regression analysis (F(4,9)= 1.60, p>.05, R2= .56).

Table 6. Regression Analysis of Peak torque of athletes at 180 ° right and left Shoulder External and Internal with 25m speed

Modal	sd	x^2	F	p
Regression	4	3265.95	2.63	.16
Differences	5	1242.41		
Total	9			

* Significant differences (P < 0.05).

There was no statistically significant difference between the athletes' 25m and the dependent variables peak torque 180 ° right and left shoulder external and internal values according to the results of the regression analysis (F(4,9)= 2.63, p>.05, R2= .68)

Table 7. 25m Speed Mean and Standard Deviation Values of Athletes

Variable	*N*	$\bar{X}$	*Ss*
25 m (second)	10	14.63	1.86

DISCUSSION

In the water polo branch, isokinetic exercises are used in which a constant speed and maximal tension is created throughout the whole range of joint range of motion.Isokinetic movements are considered to be effective exercises that one of the best increase muscle strength(4,26). In the study no relation was found between 20 m speed and upper or lower body isokinetic strength.

Shooting movement in water polo occurs from large segments with large joint gaps to smaller segments with narrower joint movements(27).The shooting of the water polo player starts from the lower extremity of the segmental movements and the resulting forces and transmits the resulting reaction force first to the shoulder and then to the finger(28).Although the movement starts from the lower extremity during the shooting(29), the most important part of the shooting is the shoulder junction. Therefore, shoulder muscle groups play an active role during water polo match(42). Also, the strength increase of the muscle groups that play an active role with training positively affects the performance of the athlete(30).Many studies have stated that development of shoulder girdle muscle strength positively affects athlete performance(9,31,32). When the literature is examined, it is thought that there are similarities when our study is compared with the mean values of isokinetic angular velocity, and this is due to the performance levels and mean age of the athletes(33).

In water sports, water is not only a necessary environment but also a factor that makes the movement easier or more difficult.As the water polo player descends deeper in the pool, he remains under a pressure equal to the weight of the water remaining on the upper surface.Other surfaces of the athlete are also affected by this pressure and their position in the water is affected during the movement(28). While the athlete is in the water, the direction of the force applied by the water is either to keep his position or to be vertical(34).The dynamic forces of the fluid increase as it goes deeper, so athletes apply force against pressure to always stay up(35).

Dynamic force is the net force created by the pull-drag-friction force of the fluid by lifting. As a result, the force that the athlete applies to the fluid affects both his position in the water and his ability to move.In the literature, they reported that lower extremity strength had a positive effect on resistance to fluid and friction(36,37). It is observed that the values obtained in our study and the reports given in the literature are parallel. This is thought to be due to the direct relationship between fluid mechanics and the applied force.

One of the main factors affecting performance in water polo is swimming speed(32,38). The speed of the athlete determines the friction force and the position in the water. Therefore, the technique and body profile used by the athlete during swimming affect the friction force between the fluid and reveal the kinematic feature of the athlete's swimming speed.In the literature, there are studies examining the relationship between the isokinetic forces of the knee, shoulder and hip joints with speed in different branches(39,40).In the literature, it is reported that

that there is a correlation between the isokinetic forces produced by the lower and upper extremities in two different joint movements of water polo players and their speed values(8,33,38,41,42,43).This similarity of our study with the literature is thought to be due to the performance and strength of the athletes.

CONCLUSIONS

As a result, it is thought that the attractive power of the fluid is provided by the arm and shoulder muscles during swimming and the leg muscles play a supportive role for them.In addition, it is thought that the body, arm and shoulder muscles of water polo athletes need more energy and strength during swimming than their pelvic and leg muscles are an important factor for performance.For this reason, it supports the view that elite water polo players can train their upper extremity muscles at a higher level than lower extremity muscles. It can be suggested that lower and upper extremity strength exercises should be included more in the training programs of water polo athletes.

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Conflicts of Interest

The authors declare no conflict of interest.

REFERENCES

1. Van der Wende, K. (2005). The effects of game-specific task constraints on the outcome of the water polo shot. Faculty of Health and Environmental Science. Auckland University of Technology. New Zealand.
2. Smith, H. K. (1991, May). Physiological fitness and energy demands of water polo; time-motion analysis of field players and goaltenders. In Proceedings of the Federation Internationale de Natation Amateur (FINA) First World Water Polo Coaches seminar (pp. 183-207).
3. Knuttgen, H. G., & Komi, P. V. (2003). Basic considerations for exercise. Strength And Power İn Sport, 3, 3-10.
4. Yapıcı, A.(2012). Elit Su Topu Oyuncularında Şut Hızları İle İzokinetik Kas Kuvvetleri Arasındaki İlişki. Hareket ve Antrenman Bilimleri Anabilim Dalı Spor Bilimleri Doktora Programı, Doktora Tezi. Ege Üniversitesi, Sağlık bilimleri Enstitüsü, İzmir
5. D'Auria, S., & Gabbett, T. (2008). A time-motion analysis of international women's water polo match play. International Journal Of Sports Physiology And Performance, 3(3), 305-319.
6. Escalante, Y., Saavedra, J. M., Mansilla, M., & Tella, V. (2011). Discriminatory power of water polo game-related statistics at the 2008 Olympic Games. Journal of Sports Sciences, 29(3), 291-298.
7. Platanou, T. (2004). Time-motion analysis of international level water polo players. Journal of Human Movement Studies, 46(4), 319-332.
8. Tan, F. H., Polglaze, T., & Dawson, B. (2010). Reliability of an in-water repeated-sprint test for water polo. International Journal Of Sports Physiology And Performance, 5(1), 117-120.
9. Yapıcı, A., Ozkol, M. Z., Ozçaldıran, B., & Ergun, M. (2017). The relationship between throwing velocity with and without leg movements and isokinetic muscle strength in elite water polo players. European Journal Of Physical Education And Sport Science,3:(1),42-51
10. Alpaslan, G., Bekır, T., & Adela, B. (2017). The effects of three different type of exercises on aerobic and anaerobic power. Physical Education Of Students, 21(4), 152-157.
11. Soslu, R., Özkan, A., & Göktepe, M. (2016). The Relatıonshıp Between Anaerobıc Performances, Muscle Strength, Hamstrıng/Quadrıceps Ratıo, Agılıty, Sprınt Abılıty And Vertıcal Jump In Professıonal Basketball Players 1. Beden Eğitimi ve Spor Bilimleri Dergisi, 10(2), 164-173.
12. Lago-Rodríguez, Á., Domínguez, R., Ramos-Álvarez, J. J., Tobal, F. M., Jodra, P., Tan, R., & Bailey, S. J. (2020). The effect of dietary nitrate supplementation on isokinetic torque in adults: a systematic review and meta-analysis. Nutrients, 12(10), 3022.
13. Mueller, S., Stoll, J., Mueller, J., & Mayer, F. (2013). Validity of isokinetic trunk measurements with respect to healthy adults, athletes and low back pain patients. Isokinetics And Exercise Science, 21(93), 93.
14. Dauty, M., & Rochcongar, P. (2001). Reproducibility of concentric and eccentric isokinetic strength of the knee flexors in elite volleyball players. Isokinetics And Exercise Science, 9(2-3), 129-132.
15. Olyaei, G. R., Hadian, M. R., Talebian, S., Bagheri, H., Malmir, K., & Olyaei, M. (2006). The effect of muscle fatigue on knee flexor to extensor torque ratios and knee dynamic stability. Arabian Journal For Science And Engineering, 31(2), 121.
16. Özer, Ö. (2019). Investigation of the Effect of Acute Muscular Fatigue on Static and Dynamic Balance Performances in Elite Wrestlers. Journal Of Education And Learning, 8(5), 179-184.
17. Kristensen, O. H., Stenager, E., & Dalgas, U. (2017). Muscle strength and poststroke hemiplegia: a systematic review of muscle strength assessment and muscle strength impairment. Archives Of Physical Medicine And Rehabilitation, 98(2), 368-380.
18. Muñoz-Bermejo, L., Pérez-Gómez, J., Manzano, F., Collado-Mateo, D., Villafaina, S., & Adsuar, J. C. (2019). Reliability of isokinetic knee strength measurements in children: A systematic review and meta-analysis. Plos One, 14(12), e0226274.
19. Van Cingel, E. H. R., Kleinrensink, G. J., Rooijens, P. P. G. M., Uitterlinden, E. J., Aufdemkampe, G., & Stoeckart, R. (2001). Learning effect in isokinetic testing of ankle invertors and evertors. Isokinetics And Exercise Science, 9(4), 171-177.
20. Makaraci, Y., &Agaoglu, S. A. (2021). Effect Of Isokinetic Shoulder Performance, Electromyographic Activation And Throwing Velocity On Shooting Accuracy In Elite Male Handball Players. South African Journal For Research In Sport, Physical Education & Recreation, 43(1).
21. Aktaş, S., Tatlici, A., & Çakmakçi, O. (2019). Determination of Isokinetic Strength of Upper and Lower Body of Elite Male Boxers. Turkish Journal of Sport and Exercise, 21(2), 188-191.
22. Soslu, R., Özer, Ö., & Çuvalcioglu, I. C. (2018). The Effects of Core Training on Basketball Athletes' Antioxidant Capacity. Journal Of Education And Training Studies, 6(11), 128-134.

23. Soslu, R., Özer, Ö., Güler, M., & Doğan, A. A. (2019). Is there any Effect of Core Exercises on Anaerobic Capacity in Female Basketball Players. Journal Of Education And Training Studies, 7(3), 99-105.
24. Tatlici, A., & Cakmakci, O. (2019). The effects of acute dietary nitrate supplementation on anaerobic power of elite boxers. Med. Dello Sport, 72, 225-233.
25. Meckel, Y.,Bishop, D., Rabinovich, M., Kaufman, L., Nemet, D., &Eliakim, A. (2013). Repeated sprint ability in elite water polo players and swimmers and its relationship to aerobic and anaerobic performance. Journal Of Sportsscience&Medicine, 12(4), 738.
26. Kocahan, T., Kaya, E., Akınoğlu, B., Karaaslan, Y., Yıldırım, N. Ü., & Hasanoğlu, A. (2017). İzokinetik Kuvvet Antrenmanının Farklı Açısal Hızlardaki Kas Kuvveti Üzerine Etkisinin İncelenmesi: Pilot Çalışma. Spor Hekimligi Dergisi/Turkish Journal of Sports Medicine, 52(3).
27. Hirashima, M., Kudo, K., Watarai, K., & Ohtsuki, T. (2007). Control of 3D limb dynamics in unconstrained overarm throws of different speeds performed by skilled baseball players. Journal of neurophysiology, 97(1), 680-691.
28. İnal, H. S. (2013). Spor ve Egzersizde Vücut Biyomekaniği. Baskı, syf, 43-45.
29. Bloomfield, J., Blanksby, B. A., Ackland, T. R., & Allison, G. T. (1990). The influence of strength training on overhead throwing velocity of elite water polo players. Aust J Sci Med Sport, 22(3), 63-67.
30. Markou, S., & Vagenas, G. (2006). Multivariate isokinetic asymmetry of the knee and shoulder in elite volleyball players. European Journal of Sport Science, 6(01), 71-80.
31. McMaster, W. C., Long, S. C., & Caiozzo, V. J. (1991). Isokinetic torque imbalances in the rotator cuff of the elite water polo player. The American Journal Of Sports Medicine, 19(1), 72-75.
32. Platanou, T., & Varamenti, E. (2011). Relationships between anthropometric and physiological characteristics with throwing velocity and on water jump of female water polo players. Journal of Sports Medicine and Physical Fitness, 51(2), 185.
33. Blazevich, A. J., Gill, N., & Newton, R. U. (2002). Reliability and validity of two isometric squat tests. The Journal of Strength & Conditioning Research, 16(2), 298-304.
34. Xu, J. (2020). Effects of Flywheel Resistance Training on Muscle Function and Sport-Specific Performance in Collegiate Club Water Polo Players.Utah State University, Master's of Science in Health and Human Movement. Utah
35. Jian-hua, Q. U. (2007). Research on the Features of Isokinetic Contract Strength of Elite Water Polo Athletes' Knee Muscles . Journal of Beijing Sport University, 5.(1)
36. Alexander, M. J. (1990). Peak torque values for antagonist muscle groups and concentric and eccentric contraction types for elite sprinters. Archives Of Physical Medicine And Rehabilitation, 71(5), 334-339.
37. Mameletzi, D., & Siatras, T. (2003). Sex differences in isokinetic strength and power of knee muscles in 10–12 year old swimmers. Isokinetics And Exercise Science, 11(4), 231-237.
38. Varamenti, E., & Platanou, T. (2008). Comparison of anthropometrical, physiological and technical characteristics of elite senior and junior female water polo players: a pilot study. Open Sports Med J, 2, 50-55.
39. Bayios, I. A., Anastasopoulou, E. M., Sioudris, D. S., & Boudolos, K. D. (2001). Relationship between isokinetic strength of the internal and external shoulder rotators and ball velocity in team handball. Journal of Sports Medicine and Physical Fitness, 41(2), 229-235.
40. Dutta, P., & Subramanium, S. (2002). Effect of six weeks of isokinetic strength training combined with skill training on soccer kicking performance. Science and soccer IV, 334-340.
41. Aleksandrović, M., Radovanović, D., Okičić, T., Madić, D., & Georgiev, G. (2011). Functional abilities as a predictor of specific motor skills of young water polo players. Journal of human kinetics, 29, 123.
42. Rechichi, C., Dawson, B., & Lawrence, S. R. (2000). A multistage shuttle swim test to assess aerobic fitness in competitive water polo players. Journal of science and medicine in sport, 3(1), 55-64.
43. McLaine, S. J., Ginn, K. A., Fell, J. W., & Bird, M. L. (2018). Isometric shoulder strength in young swimmers. Journal of science and medicine in sport, 21(1), 35-39.

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Hydration Status and Fluid Intake of Adolescent Athletes From Different Sports During Training

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Abstract

Despite many studies presenting that a high number of adult athletes start exercise in sub-optimal hydration state, limited data concerning hydration levels in athletic youth exists. This study aimed to identify the hydration status of adolescent athletes of different sports during a typical training. Sixty-nine adolescent men athletes from different sports (swimming, judo, basketball, football) voluntarily participated in the study (age: 13.7±1.7 years, experience: 4.8±2.0 years). Measurements were carried out before and immediately after training. Data collection took place at the same time of the day. All athletes trained for about 90 minutes and they consumed fluids ad libitum during their training. Pre-training urine measurement revealed that 58.2% of the athletes started training in dehydrated state (Urine Specific Gravity [USG]≥1.020). Besides, 63.3% of the athletes completed the training in also dehydrated state with USG values ≥ 1.020 and urine colour between 4-6. Mean body weight loss during the training was -0.26±0.40 kg. This study concluded that the prevalence of dehydration in adolescent athletes is high according to USG and urine colour values. Great number of the athletes arrived at training in dehydrated state and dehydrated even more during training despite access to fluids. Some educational programs and measures for optimal hydration in adolescent athletes should be taken into consideration.

Keywords: fluid intake; young athletes; dehydration

INTRODUCTION

Maintaining fluid balance is very important for performance and temperature regulation in both young and adult athletes. It has already been clearly demonstrated that even low levels of dehydration cause physiological stress, mediated by a disproportionate increase in heart rate, accompanied by a decrease in cardiac output, which reduces the body's ability to remove heat (13,14). Moreover, ≥2% dehydration of total body weight significantly reduces exercise, skill and mental performances in both laboratory and field studies. (1,4,6,8). Moreover, recent studies have shown that lower dehydration levels (~1%) trigger undesirable changes in athletic performance (5,11).

Studies examining the hydration status of young people exercising under hot environmental conditions have revealed that most of the athletes are dehydrated from the beginning of the training and this condition is maintained throughout the measurement days and they show insufficient hydration habits. This situation may occur with insufficient fluid intake and long-term fluid deficiency despite the presence of sufficient fluid in the training areas (2,17,18).

Current studies show that young athletes come to training dehydrated, do not consume enough fluids during training, thus voluntary dehydration is common in both indoor and outdoor sports (10,12,18). Although there are many studies examining the hydration status and related variables in adult athletes from different sports, there are limited studies comparing the hydration status of adolescent athletes from different sports. Also, there are no current studies monitoring fluid balance of adolescent athletes. Therefore, the aim of this study was to reveal the hydration status and fluid intake of adolescent athletes engaged in different sports during a training session. Our study had two main

hypotheses; 1) Adolescent athletes who do sports indoors would consume more fluid than those who do outdoor sports, and 2) Adolescent athletes would dehydrate both before and after training.

MATERIAL AND METHODS

Approach to the Problem

The detrimental effects of dehydration on athletic performance have been demonstrated by numerous studies. Moreover, most of the studies in the literature focus on elite adult athletes. In addition, this study aimed to reveal the changes in hydration status in adolescent athletes from different sports in a typical training session. In conclusion, this descriptive study was designed to determine the hydration status and fluid intake of adolescent athletes.

Participants

Sixty-nine adolescent athletes (swimming: 12, judo: 22, basketball: 15 and football: 30) voluntarily participated in the study. The characteristics of the participants are presented in Table 1. Athletes and their coaches agreed to participate in the study, and signed informed consent forms were obtained from both athletes and their legal guardians. The criteria for participation in the study included; absence of a current health problem and having at least 2 years of sports experience. All measurements were performed in accordance with the Declaration of Helsinki. Ethical approval was obtained from Kastamonu University Clinical Research Ethics Committee (Date: 28/01/2021, No: 2020-KAEK-143-32).

Data Collection

Data collection took place in the middle of the week. The day before the measurement, the athletes were instructed not to use performance-enhancing food or beverages (i.e, cafein). Two sterile urine containers were given to the athletes for urine collection before and after training. The body weight of the athletes was measured before and after the training. The water consumed by the athletes during the training was monitored, but the athletes were not encouraged to consume fluid and they continued their habitual fluid consuming. The hydration status of the athletes was determined by urine specific gravity (USG) and urine color (UC). USG was measured with a digital refractometer (ATAGO PAL-10S, Japan), while UC was classified by the same researcher each time. The hydration status of the athletes was classified as hydrated (≤1.020) or dehydrated (>1.021) according to Sawka et al. (20) UC was classified according to Casa et al. (7). All measurements were performed by the same researcher each time.

Statistical Analysis

Data were expressed as mean and standard deviation. In addition, 95% confidence intervals of the data were given. The normality of the data was tested with Shapiro-Wilk test and descriptive methods such as the skewness and kurtosis coefficients (15). The two-way repeated measures ANOVA (4 x 2) (sport x time) test was used to determine the differences in USG, UC, body weight and fluid consumption between the groups. Eta squared (η^2_p) was calculated to determine the effect size (ES), and 0.0099, 0.0588, and 0.1379 were considered as small, medium, and large effect sizes, respectively (9). The relationship between fluid intake, body weight change, and USG changes was tested with the Pearson correlation test. Statistical significance was set at $p<0.05$.

RESULTS

Information about the age, height, BMI and sports experiences of the participants is given in Table 1.

Table 1. Characteristics of the athletes

Variables	Swimming (N=12)	Judo (N=22)	Basketball (N=15)	Football (N=30)
Age (year)	13.4±2.1	12.0±0.7	13.0±0.0	15.4±0.6
Height (m)	1.59±0.14 (1.49-1.68)	1.52±0.10 (1.50-1.55)	1.69±0.10 (1.64-1.75)	1.72±0.06 (1.70-1.75)
Body mass (kg)	50.2±15.1 (40.5-59.8)	45.3±1.7 (41.5-49.0)	63.4±3.7 (55.4-71.3)	61.8±1.4 (58.8-64.8)
BMI (kg/cm2)	19.4±2.5 (17.7-21.0)	19.2±2 .6 (18.1-20.4)	21.8±3.3 (19.9-23.6)	20.6±2.1 (19.8-21.4)
Experience (year)	6.4±2.1 (5.0-7.8)	3.2±1.0 (2.8-3.7)	5.1±2.1 (3.9-6.3)	5.3±1.7 (4.6-5.9)

According to repeated measures ANOVA results, there was a significant interaction effect of time and sport ($F_{3\text{-}75}$=3.42; p=0.02; ES=0.121) on body mass of the athletes. Moreover, the effect of time and sport factors was separately found significant on changes in body mass ($F_{1\text{-}75}$=38.78; p=0.00; ES=0.341; $F_{3\text{-}75}$=13.45; p=0.00; ES=0.350, respectively). When pairwise comparison was carried out, a significant difference in body mass change was found between swimmers and judo athletes (p<0.05). Body mass changes of the athletes are presented in Figure 1.

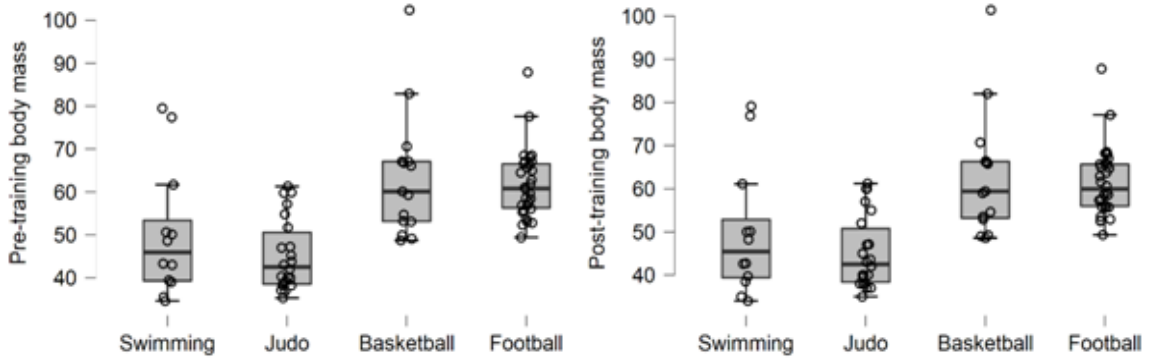

Figure 1. Body mass changes of the athletes pre and post training

The interaction effect of time and sport was significant for USG ($F_{3\text{-}75}$=5.94; p=0.001; ES=0.192). While a significant effect of sport was found in USG ($F_{3\text{-}75}$=5.94; p=0.001; ES=0.192), there was no main effect of time on USG ($F_{3\text{-}75}$=0.31; p=0.60; ES=0.004). Swimmers presented significantly lower USG values compared to the rest at both pre and post training (p<0.05). USG values of the athletes can be found in Table 2.

Table 2. USG values of the athletes pre and post training

	Pre-training	Post-training	p
Swimming (N=12)	1.018±0.008 (1.013-1.023)	1.013±0.005 (1.009-1.016)	0.058
Judo (N=22)	1.022±0.004 (1.020-1.025)	1.023±0.004 (1.021-1.025)	0.291
Basketball (N=15)	1.020±0.006 (1.016-1.023)	1.023±0.006 (1.020-1.027)	0.017
Football (N=30)	1.021±0.006 (1.020-1.024)	1.022±0.006 (1.019-1.024)	0.630

There was a significant interaction effect of time and sport on UC ($F_{3\text{-}75}$=3.51; p=0.019; ES=0.123). However, there was no main effect of time and sport separately on UC ($F_{1\text{-}75}$=3.77; p=0.056; EB=0.048; $F_{3\text{-}75}$=1.47; p=0.228; ES=0.056, respectively). The UC values of the athletes can be found in Table 3.

Table 3: The UC values of the athletes before and after the training

	Pre-training	Post-training
Swimming (N=12)	5.17±2.51 (3.5-6.7)	3.58±2.02 (2.3-4.8)
Judo (N=22)	6.00±2.02 (5.1-6.9)	5.27±2.02 (4.3-6.1)
Basketball (N=15)	4.33±2.19 (3.1-5.5)	5.20±2.00 (4.0-6.3)
Football (N=30)	5.07±2.13 (4.2-5.8)	4.63±2.04 (3.8-5.4)

When athletes' USG values were classified, 58.2% of the athletes were dehydrated while 41.8% of them were hydrated before training. Following the training session, the ratio of the dehydrated athletes increased to 63.3% and the ratio of the hydrated athletes was 36.7%. The classification of the hydration status of athletes from each sport can be found in Figure 2 and 3.

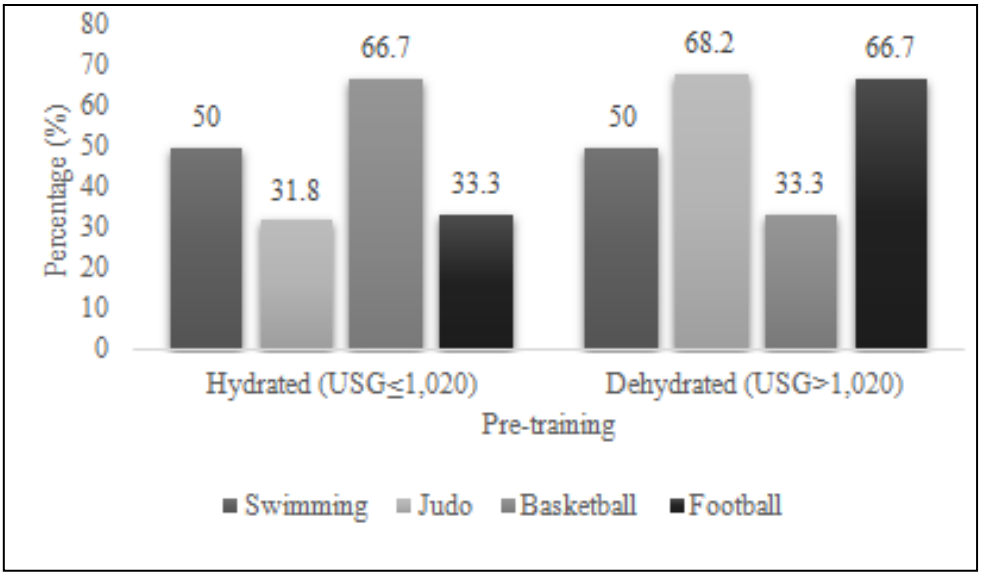

Figure 2. USG classification of the athletes before training

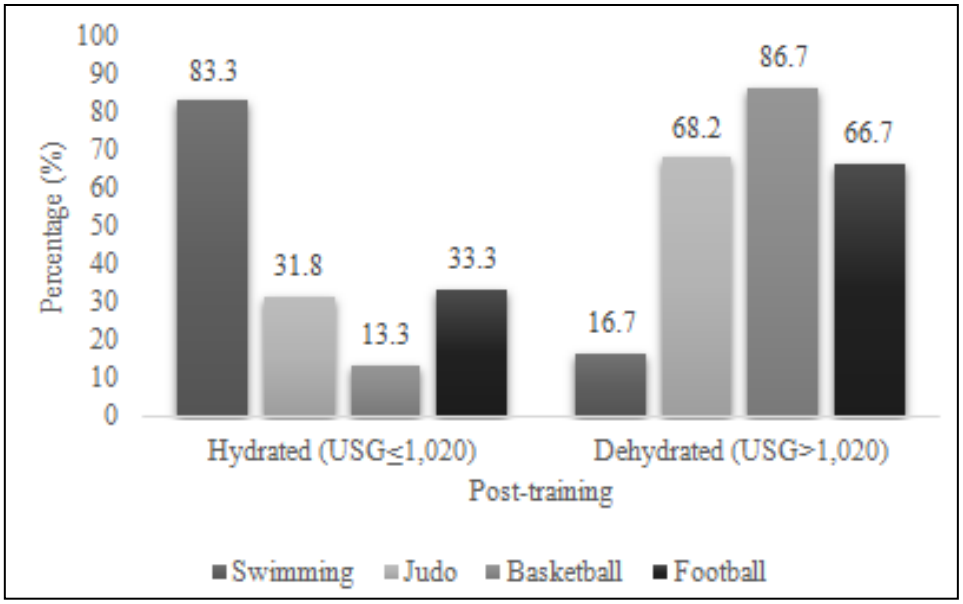

Figure 3. USG classification of the athletes after training

As shown in Figure 2, the majority of the athletes except swimming and basketball arrive at the training in a dehydrated state. According to the classification after training (Figure 3), most of the athletes completed the training session in a dehydrated state except for swimmers despite accessibility of fluid.

There was a significant association between fluid intake and body mass changes in the athletes (r=0.448; p=0.000), there was no significant association between fluid intake and USG changes (r=0.179; p=0.114)

DISCUSSION

This study aimed to determine the hydration status and fluid intake of adolescent athletes from different sports during a training session. The most important finding of the study was that the majority of the athletes started training in a dehydrated state and completed the training in a dehydrated state again despite availability of fluids.

Since the measurements took place in the middle of the week, while the athletes were participating in their regular training, the pre-training USG values showed that the athletes acquired insufficient rehydration habits outside of training and came to the training without being rehydrated. Similarly, in a study where hydration status and fluid intake of young elite athletes were investigated, Arnoutis et al. (2) stated that the athletes arrived at the training with a high level of dehydration and they worsened the hydration status although they had access to fluid during the training. Likewise, Ashadi et al. (3) investigated hydration status of young runners before and after training and highlighted increased dehydration in most of the athletes after training. Muth et al. (16) monitored hydration status and fluid loss perceptions of the athletes and they were reported to maintain their hydrated state and improved their perception of sweat loss during the study. Professional football players who had a match play in a hot and humid environment started the match in euhydrated state (19), which confirms that there may be differences in hydration knowledge among difference age groups.

The findings of the study reveal that there was a significant increase in the hydration status of judokas, basketball players and football players. This finding is important because two of the aforementioned sports are practiced indoors and athletes have more opportunities to consume fluids as they have easier access to fluids and more frequent breaks during training. However, in parallel with our study, young athletes who train indoors are stated to be exposed to fluid loss during exercise (2,18,20). These findings highlighted that voluntary dehydration is high in young athletes.

In the literature, it is commonly recommended for athletes to consume fluids when they feel thirsty during hot environment (18,20). The findings of our study do not support this view. In the study, we expected that athletes would experience hyperosmotic hypovolemia due to dehydration, resulting in dehydration during training, which would lead to greater fluid intake. However, contrary to our expectations, the athletes remained dehydrated at the end of the training despite the presence of fluid in the training area. Therefore, personalized rehydration strategies should be developed without leaving fluid consumption to the preferences of the athletes.

This study had some limitations. Urinary indices such as USG present high variety and especially a single-time-point hydration status assessment could be insufficient (21). Moreover, morning USG assessments are more appropriate to determine hydration status (22). Future studies could include morning USG measurements following a-night fasting to determine athletes' morning hydration status as well as before and after the training.

CONCLUSION

In conclusion, young athletes showed high level of dehydration on a training day. Therefore, it is of great importance to make adolescent athletes gain the habit of consuming enough fluids during the day so that they can come to training in a hydrated state. Adolescent athletes should be encouraged to drink frequently during training. In addition, fluid intake plans should be recommended according to the individual needs of the athletes. Evaluating the hydration status of athletes before exercise is of great importance to avoid the negative effects of insufficient fluid intake and prolonged fluid deficiency on performance and health.

REFERENCES

1. Ali A, Gardiner R, Foskett A, & Gant N. Fluid balance, thermoregulation and sprint and passing skill performance in female soccer players. Scandinavian Journal of Medicine & Science in Sports. 2011; 21(3): 437-45.
2. Arnaoutis G, Kavouras SA, Kotsis YP, Tsekouras E, Makrillos M, & Bardis, CN. Ad libitum fluid intake does not prevent dehydration in suboptimally hydrated young soccer players during a training session of a summer camp. International Journal of Sport Nutrition and Exercise Metabolism. 2013; 23(3): 245-51.
3. Ashadi, K., Mirza, D. N., & Siantoro, G. (2018). Hydration status in adolescent runners: pre and post training. In IOP Conference Series: Materials Science and Engineering (Vol. 296, No. 1, p. 012014). IOP Publishing.
4. Baker LB, Dougherty KA, Chow M, & Kenney WL. Progressive dehydration causes a progressive decline in basketball skill performance. Medicine and Science in Sports and Exercise. 2007; 39(7): 1114-23.
5. Bardis CN, Kavouras SA, Arnaoutis G, Panagiotakos DB, & Sidossis LS. Mild dehydration and cycling performance

during 5-kilometer hill climbing. Journal of Athletic Training. 2013; 48(6): 741-47.
6. Barley, O. R., Iredale, F., Chapman, D. W., Hopper, A., & Abbiss, C. R. (2018). Repeat effort performance is reduced 24 hours after acute dehydration in mixed martial arts athletes. The Journal of Strength & Conditioning Research, 32(9), 2555-2561.
7. Casa DJ, Armstrong LE, Hillman SK, Montain SJ, Reiff RV, Rich BS, et al. National Athletic Trainers' Association position statement: fluid replacement for athletes. Journal of Athletic Training. 2000; 35(2): 212.
8. Casa DJ, Stearns RL, Lopez RM, Ganio MS, McDermott BP, et al. Influence of hydration on physiological function and performance during trail running in the heat. Journal of Athletic Training. 2010; 45(2): 147-56.
9. Cohen J. [The effect size index: d. Statistical Power Analysis For the Behavioral Sciences]. 1988; 2nd Edition, Erbaum Press.
10. Da Silva RP, Mündel T, Natali AJ, Bara Filho MG, Alfenas RC, Lima J R., et al. Pre-game hydration status, sweat loss, and fluid intake in elite Brazilian young male soccer players during competition. Journal of Sports Sciences. 2012; 30(1): 37-42.
11. Driscoll, R. L., McCarthy, D. G., Palmer, M. S., & Spriet, L. L. (2020). Mild dehydration impaired intermittent sprint performance and thermoregulation in females. Applied Physiology, Nutrition, and Metabolism, 45(9), 1045-1048.
12. Gibson JC, Stuart-Hill LA, Pethick W, & Gaul CA. Hydration status and fluid and sodium balance in elite Canadian junior women's soccer players in a cool environment. Applied Physiology, Nutrition, and Metabolism. 2012; 37(5): 931-37.
13. Gonzalez-Alonso J, Mora-Rodriguez R, Below PR, & Coyle EF. Dehydration reduces cardiac output and increases systemic and cutaneous vascular resistance during exercise. Journal of Applied Physiology. 1995; 79(5): 1487-96.
14. Gonzalez-Alonso J, Mora-Rodriguez R, Below PR, & Coyle EF. Dehydration markedly impairs cardiovascular function in hyperthermic endurance athletes during exercise. Journal of Applied Physiology. 1997; 82(4): 1229-36.
15. Mishra P, Pandey CM, Singh U, Gupta A, Sahu C, & Keshri A. Descriptive statistics and normality tests for statistical data. Annals of Cardiac Anaesthesia. 2019; 22(1): 67–72.
16. Muth T, Pritchett R, Pritchett K, Depaepe J, & Blank R. Hydration status and perception of fluid loss in male and female university rugby union players. International Journal of Exercise Science, 2019, 12.3: 859.
17. Noakes TD. Is drinking to thirst optimum? Annals of Nutrition and Metabolism. 2010; 57(Suppl. 2): 9-17.
18. Osterberg KL, Horswill CA, & Baker LB. Pregame urine specific gravity and fluid intake by National Basketball Association players during competition. Journal of Athletic Training. 2009; 44(1): 53-57.
19. Kurdak SS, Shirreffs SM, Maughan RJ, et al. Hydration and sweating responses to hot-weather football competition. Scand J Med Sci Sports. 2010;20 Suppl 3:133-139.
20. Rivera-Brown AM, & De Félix-Dávila RA. Hydration status in adolescent judo athletes before and after training in the heat. International Journal of Sports Physiology and Performance. 2013; 7(1): 39-46.
21. Zubac D, Cular D, Marusic U. Reliability of Urinary Dehydration Markers in Elite Youth Boxers. Int J Sports Physiol Perform. 2018;13(3):374-381.
22. McDermott BP, Anderson SA, Armstrong LE, et al. National Athletic Trainers' Association Position Statement: Fluid Replacement for the Physically Active. J Athl Train. 2017;52(9):877-895.

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The Effect of the Adapted Physical Education Course on the Attitudes of the University Students towards the Education of Individuals with Disabilities

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Abstract

The aim of this study was to determine the effect of an undergraduate Adapted Physical Education (APE) course on the attitudes of Sports Science students towards the education of individuals with disabilities. A single group (no control group) pre-test and post-test model was used in the study. The study group consisted of 119 Sports Coaching Education Department students studying at Aksaray University. The data were collected with the "Personal Information Form" and the "Attitude toward Disabled Persons Scales" (ATDP). The course was given to the participants theoretically for 14 weeks and 60 minutes a week. After the descriptive statistics of the study data were determined, the normality of the data was tested with the Shapiro-Wilk test and the comparison of pre-test and post-test scores was conducted with Paired Samples t-Test. It was concluded that the APE course positively affected the attitudes of the Faculty of Sports Sciences students towards the education of individuals with disabilities.

Keywords: Attitude, Individuals with Disabilities, Sports Sciences, Adapted Physical Education

INTRODUCTION

Attitudes are the starting point for success (22,46) and attitudes of instructors are an important determinant of their behavior in educational settings (13). Negative attitudes towards individuals with disabilities (IDs) arise from the lack of information about these individuals (25,33), and from prejudices such as misperceptions and negative emotions. For the reasons mentioned above, active participation of IDs in community life is limited (24).

Attitude expresses whether the individual is in favor of performing a certain behavior or not. According to Ajzen (4), attitudes towards certain behaviors are determined by specific beliefs in a society. Behavioral beliefs associate a relevant behavior with expected outcomes (31). One of the key factors for successful inclusive education is a positive social environment that includes the positive attitudes of stakeholders such as trainers, peers, and parents (39). It has been determined that when information and experience are used together, they affect attitudes towards IDs more positively (21). In changing attitudes positively, giving information and interacting are accepted as effective variables (52). Al-Hadabi et al. (6), stated that the more information university students have about individuals with intellectual disabilities, the more positive attitudes they show towards individuals with intellectual disabilities doing sports. In

addition, they stated that attitudes as a form of behavior are acquired as a result of the experience and interaction of the individual with his environment. Kowalski and Rizzo (28) stated that experience, perceived professional competence, age and gender variables affect attitudes. It is stated that professional preparation and experience have a significant impact on the attitudes of physical education teachers and candidates and also good preparation for the profession is an important factor in physical education teachers sense of professional competence and effective teaching (35).

Sports Coaching Education programs should prepare future coaches to work in different environments and with athletes with different skills. In Turkey, APE course was given as an optional course in 56% of the Faculty of Sport Sciences between 1990-2000 (27), and since 2001 it has been a compulsory course (36). In studies with physical education teachers; negative attitudes of teachers have been identified as an obstacle to the inclusive and integrative education of IDs (14,15,29). For this reason, university programs should develop strategies to prepare university students to work with IDs (46,56). In studies examining the demographic characteristics and attitudes of the students of the Faculty of Sport Sciences; it was determined that female students had higher attitude scores than males (26,38). There are also studies in which the class variable did not affect students' attitudes towards inclusion (6,7,19). It has also been stated that negative internship experiences contribute to the formation of negative attitudes (45). Negative teaching experiences can be attributed to a lack of quality education in APE (51).

Besides students of the Faculty of Sport Sciences, in studies conducted in different fields such as health workers (11); health students (50), classroom teachers (43), it has been determined that attitudes against IDs are negative. When the literature is examined, limited study has been reached that examines the attitudes of the students of the Faculty of Sport Sciences towards the education of IDs. For this reason, it is thought that it would be beneficial to collect data on the attitudes of the stakeholders about Physical Education and Sports (PES) in IDs. Determining the attitudes of sports science students, one of these stakeholders, towards the education of IDs, and the effect of APE course on attitude scores constitutes the reason of this study.

In this context, the study was conducted to determine the effect of the APE course on the attitudes of Sports Science students towards the education of disabled individuals.

MATERIALS AND METHODS

Research model

In this study, one of the quasi-experimental designs, a single group (without control group) pre-test and post-test model was used to determine the effect of the APE course on the attitudes of Sports Science students towards the education of IDs.

Participants

119 students studying at Aksaray University, Faculty of Sport Sciences Coaching Education Department voluntarily participated in the study.

Data Collection Tools

"Personal Information Form" prepared by the researcher was used to reach the demographic information of the participants. The "Attitude Toward Disabled Persons scales" (ATDP) was used to evaluate the attitudes of the participants towards IDs. The scale was developed by Yuker et al. (1970) and adapted into Turkish by Özyürek (37). ATDP aims to measure attitudes towards IDs without separating disability groups. There are 20 items in the scale. It is a six-point Likert type scale with answers and (+3) I strongly agree, (+2) I agree, (+1) I somewhat agree, (-1) I somewhat disagree, (-2) I disagree, (-3) I strongly disagree. The 2., 5., 6., 11. and 12. items in the scale are scored by reversing. All items are summed up taking into account the signs and then sign of the found score (+/- or -/+) is reversed. The total score is found by adding +60 points to the obtained score. The lowest 0 and the highest 120 points can be obtained from the scale. A high score from the scale means that IDs are perceived as similar to individuals without special needs. A low score indicates that IDs are perceived differently from individuals without special needs (42). The Cronbach Alpha reliability coefficient of the scale was 0.67-0.83; test-retest reliability coefficient was calculated as 0.76 (21). In the current study, the Cronbach Alpha internal reliability coefficient of the scale was 0.77; test-retest reliability coefficient was calculated as 0.89.

Data Collection

It has been determined that the study is in compliance with ethical principles with the decision numbered 2020/13-49 of Aksaray University Human

Research Ethics Committee. The data was collected online survey form (Google Forms). APE course was given online and 60 minutes a week for 14 weeks between March 2021 and June 2021 to Aksaray University Faculty of Sport Sciences Coaching Education students. Only theoretical knowledge was given to the participants, lack of interaction with IDs and not being given the opportunity to experience through the APE course was considered as an important limitation.

Within the scope of the course, the participants were informed about the definition of Special Education, definitions of hearing impairment, vision impairment, intellectual disabled, physical disability and other disability types, such as classifications, causes of disability, prevalence, cognitive, affective, social and motoric features, teaching methods and techniques. An evaluation was made about the recommended books and movies.

Content of APE Course

Table 1. Subject distribution by weeks

Week	Subjects
1	Pre-test practice, informing about the purpose of the lesson
2	Disability and Causes of Disability
3	Types of Disabilities
4	Children with Hearing Impairment and Sports Activities
5	Children with Visual Impairment and Sports Activities
6	Children with Intellectual Disabilities and Sports Activities
7	Children with Physical Disabilities and Sports Activities
8	Children with Other Disabilities and Sports Activities
9	Individual and Team Sports for Children with Hearing Impairment
10	Individual and Team Sports for Children with Visual Impairment
11	Individual and Team Sports for Children with Intellectual Disabilities
12	Individual and Team Sports for Children with Physical Disabilities
13	Individual and Team Sports for Children with Other Disabilities. Evaluation of Books Read and Movies Watched Related to Special Education
14	Evaluation of Books Read and Movies Watched Related to Special Education, Post-Test Practice

Recommended Books

Auggie & Me: Three Wonder Stories (R. J. Palacio), Fingertips (Seran Demiral), Disabled Slope (Makbule Ölçen), Seeing Voices (Oliver Sacks), A Mind at a Time (Mel Levine).

Recommended Movies

I am a Sam, Forrest Gump, The Eighth Day, In Place Stars, Temple Grandin, My World, My Left Foot, Black, Mozart and the Whale, You are not You.

Data Analysis

The data were analyzed with the SPSS 22.0 statistical package program. The normality of the data was tested with the Shapiro-Wilk test and the distribution of the data was found to be normal ($p>0.05$). Pre-test and post-test data were compared with Paired Samples t-test. The margin of error for the analyzes was taken as 0.01.

FINDINGS

Table 2. Descriptive Information on Demographic Features of the Participants

Variables	Groups	f	%
Gender	**Female**	61	51.3
	Male	58	48.7
The state of being a special needs individual in the family	Yes	12	10.1
	No	107	89.9
PES experience with a special needs individual	Yes	15	12.6
	No	104	87.4
The state of wanting to work with a special needs individual	Yes	99	83.2
	No	20	16.8

When Table 2 is examined, the participants; 51.3% female, 48.7% male, 89.9% of them do not have a family member with special needs, 10.1% of them have a person with special needs in their family, 87.4% of

them did not experience PES with IDs, 12.6% of them had PES experience with IDs, 83.2% want to work with IDs, 16.8% don't not want to work.

Table 3. Comparison of participants attitudes towards individuals with special needs pre-test and post-test scores

Scale Score	Mean	N	Ss	t	df	p
Pre Test	59.07	119	11.06	-12.131	118	0.000*
Post Test	69.18	119	7.33			

*p<0,01

When Table 3 is examined, a statistically significant difference was found between the pre-test and post-test attitude scores of the participating in the study towards IDs (p<0.01). According to this finding, it can be said that the APE course affects the attitudes of the participants positively.

DISCUSSION

This study was conducted to determine the effect of the APE course on the attitudes of the Sports Coaching Education students towards the education of IDs. It was concluded that the APE course positively affected the attitudes of the students participating in the study towards the education of IDs. In the literature, many study results have been reached that are in line with this study finding. In the study by Hodge and Jansma (23), APE course given to the students of Physical Education Teaching and Recreation Department, it has been determined that students have changed their attitudes towards giving education to IDs in a positive way. In the study conducted by Akbuğa and Gürsel (5), it was found that the education given to the students of the

Department of Physical Education and Sports Teaching through informing, it was determined that students changed their attitudes towards individuals with physical disabilities in a positive way. In the study conducted by Gürsel (21), it was found that the 14-week Physical Education and Sport Lesson for the Disabled, it has been reported that the students of the Department of Physical Education and Sports Teaching are effective in their attitudes against individuals with physical disabilities.

Thompson et al. (55) stated that negative social attitudes towards IDs are generally based on lack of understanding, fear of the unknown, and stereotypes learned from others. In the study conducted by Block and Rizzo (16), academic preparation for IDs positively affected the attitudes of physical education teachers towards educating students with severe degree special needs and academic preparation helped teachers better understand the characteristics and abilities of IDs. Studies have been carried out to define and improve the attitudes of university students against these individuals. In the study conducted by Sezer (44) with teacher candidates studying in different departments of the Faculty of Education, a 10-week preventive guidance program was applied to teacher candidates' in order to develop a positive attitude towards IDs. It has been determined that the preventive guidance program has positively changed the attitudes of teacher candidates against these individuals. Gözün and Yıkmış (20) applied an information program to teacher candidates studying in different programs at the Faculty of Education. It has been determined that the program has a positive effect on the attitudes of teacher candidates against inclusive education. In the study conducted by Şahin and Güldenoğlu (49) with the students of the Child Development department, the education program given with the information technique including special education and inclusion issues, it was reported that the participants changed their attitudes against IDs in a positive way. In the study conducted by Alptekin and Batık (8), it was found that the information given to the students of the Special Education course and the Deaf Education Department positively changed the attitudes of the students against IDs (vision impairment, hearing impairment, intellectual disability and physically disability). However, the study was stated that the information was forgotten over time and the change in attitudes returned to its former state. Melekoğlu (32) determined that the Special Education course, which includes interaction with IDs for teacher candidates studying in different departments, positively changed the attitudes of the participants towards students with special needs.

Contrary to these, in the study conducted by Alsalhe (9), it was concluded that the APE course given to physical education teachers candidates did not change the attitudes of the participants against IDs. Similarly, Rizzo (40) reported that there was no

relationship between the attitudes of physical education teachers and APE course. It is thought that the inconsistency of the current study findings with these study findings is due to the content of the applied programs.

In addition to the theoretical education based on information with IDs, the results of the study conducted with different sample groups showing that contact-based education increases positive attitudes have been reached. These were: High school students (17), physiotherapy students (34,48), medical school students (53), health professionals (54). Adler et al. (3) it was determined that a training program which includes both information and contact positively changed the attitudes of optometrist students against IDs. In the study done by Thompson et al. (55) with Nursing Department students, it was determined that the theoretical and practical training given to the students (in rehabilitation centers) changed the attitudes of the participants against IDs in a positive way.

CONCLUSION and RECOMMENDATIONS

This study shows that the APE course given by informing affects the attitudes of the Coach Candidates towards the education of IDs. It can also contribute to the development of perceived competence in addition to the attitude of the participants. It is seen that the attitudes of Coach Candidates towards IDs can be changed by providing individual and group information on problem solving, adapting equipment, and choosing activities suitable for the current performance level with APE course. In addition to information-based programs, future study can investigate how "applied" experiences affect students' attitudes towards IDs. In addition, after a certain period of time after the program, it can be determined whether the attitudes have changed with the permanence test that measures the continuity of the attitudes. The lack of physical education end sport experience as well as theoretical knowledge with IDs was considered as an important limitation in the studies to be conducted. In future research, information and experience can be used together, control group designs can be used, and studies can be carried out with larger sample groups.

REFERENCES

1. Abu Darwesh M, Bsharah M. The effect of studying the course of teaching those of special needs on students' attitudes toward the handicapped. Jordan Journal of Education Sciences, 2007; 3(4): 385-395.
2. Acak M, Karakaya YE, Tan Ç, Coşkuner Z. Investigation of the attitudes of students from exercise and sports education for individuals with disabilities department toward individuals with disabilities. Turkish Studies, 2016; 11(19): 1-8. doi:10.7827/TurkishStudies.10045.
3. Adler P, Cregg M, Duignan A, Ilet G, Woodhouse M. Effect of training on attitudes and expertise of optometrists towards people with intellectual disabilities. Ophthalmic and Physiological Optics, 2005; 25: 105–118. doi:10.1111/j.1475-1313.2004.00253
4. Ajzen I. Attitudes, personality, and behavior. McGraw-Hill Education, 2005.
5. Akbuğa B, Gürsel F. Changing college student physical education teacher's attitudes towards individuals with physical disability by knowledge. SPORMETRE The Journal of Physical Education and Sport Sciences, 2007; 5(1): 5-8.
6. Al-Hadabi B, Al-Zoubi S, Bakkar B, Al-Yahyai F, Al-Gaseem M, Al-Qaryouti I. Effects of an adapted physical education course on attitudes toward sport of Omani individuals with disabilities. Universal Journal of Educational Research, 2021; 9(2): 255-264.
7. Alkan İ. Examination in terms of self-efficacy of the attitudes of the students of physical education and sports collage towards the disabled. Master Thesis, Mustafa Kemal University, Institute of Health Sciences, 2018; Hatay.
8. Alptekin S, Batık MV. Effect of special education course on department of special education students` attitudes toward persons with disability. e-International Journal of Educational Research, 2013; 4(4): 18-34.
9. Alsalhe T. The influence of the traditional APE course on the attitudes of preservice physical educators in Saudi Arabia toward teaching students with physical disabilities. Journal of Educational & Psychological Sciences, 2015; 16(4): 610-624.
10. Al-Yahyai F, Al-Zoubi S, Bakkar B, Al-Hadabi B, Al-Gaseem M, Al-Qaryouti I. Effects of a special art education course on attitudes toward Omani learners with special needs. International Journal of Higher Education, 2021; 10(1): 191-200.
11. Au KW, Man DW. Attitudes toward people with disabilities: A comparison between health care professionals and students. International Journal of Rehabilitation Research, 2006; 29(2): 155–160. doi:10.1097/01.mrr.0000210048.09668.ab
12. Avramidis E, Bayliss P, Burden R. A survey into mainstream teachers' attitudes towards the inclusion of children with special educational needs in the ordinary school one local education authority. Educational Psychology, 2000; 20(2): 191-211.
13. Avramidis E, Norwich B. Teachers' attitudes towards integration/inclusion: A review of the literature. European Journal of Special Needs Education, 2002; 17(2): 129-147.
14. Block ME, Hutzler Y, Barak S, Klavina A. Creation and validation of the self-efficacy instrument for physical education teacher education majors toward inclusion. Adapted Physical Activity Quarterly, 2013; 30: 184–205.
15. Block ME, Obrusnikova I. Inclusion in physical education: A review of the literature from 1995-2005. Adapted Physical Activity Quarterly, 2007; 24(2): 103-124.
16. Block ME, Rizzo TL. Attitudes and attributes of physical educators associated with teaching individuals with severe and profound disabilities. Journal of the Association for Persons with Severe Handicaps, 1995; 20(1): 80-87.
17. Chen CCH, Lee TMC, Yuen HK, Chan F. Attitudes toward people with disabilities between Chinese rehabilitation and business students: An implication for practice rehabilitation psychology. Rehabilitation Psychology, 2002; 47(3): 324-338.

18. DePauw KP, Karp GG. Attitudes of selected college students toward including disabled individuals in integrated settings. Adapted Physical Activity. Springer, 1990: 149-157.
19. Di Nardo M, Kudláček M, Tafuri D, Sklenaříková J. Attitudes of preservice physical educators toward individuals with disabilities at University Parthenope of Napoli. Acta Gymnica, 2014; 44(4): 211-221.
20. Gözün Ö, Yıkmış A. The effectiveness of informing teacher candidates about mainstreaming in changing their attitudes towards inclusion. Ankara University Faculty of Educational Sciences Journal of Special Education, 2004; 5(2): 65-77.
21. Gürsel F. Physical education and sports for the disabled course and students' attitudes. Journal of Education, 2006; 31(31): 67-73.
22. Heikinaro-Johansson P, Sherrill C. Integrating children with special needs in physical education: A school district assessment model from Finland. Adapted Physical Activity Quarterly, 1994; 11(1): 44-56.
23. Hodge SR, Jansma P. Effects of contact time and location of practicum experiences on attitudes of physical education majors. Adapted Physical Activity Quarterly, 1999; 16(1): 48-63.
24. Hutzler Y, Zach S, Gafni O. Physical education students' attitudes and self-efficacy towards the participation of children with special needs in regular classes. European Journal of Special Needs Education, 2005; 20(3): 309–327. doi:10.1080/08856250500156038
25. Ison N, McIntyre S, Rothery S, Smithers-Sheedy H, Goldsmith S, Parsonage S, et.al. 'Just like you': A disability awareness programme for children that enhanced knowledge, attitudes and acceptance: Pilot study findings. Developmental Neurorehabilitation, 2010; 13(5): 360–368. doi:10.3109/17518423.2010.496764
26. Karademir T, Açak M, Türkçapar Ü, Eroğlu H. Determination of physical education teacher candidates' attitudes towards mental disability. Journal of Physical Education and Sport Sciences, 2018; 20(3): 103-112.
27. Konar N, Yıldıran İ. Physical education and sports teaching for the disabled: Requirements and a program model. Selçuk University Journal of Physical Education and Sport Science, 2012; 14(2): 208-216.
28. Kowalski EM, Rizzo TL. Factors influencing preservice student attitudes toward individuals with disabilities. Adapted Physical Activity Quarterly, 1996; 13(2): 180-196.
29. Li C, Chen S, Zhang J. A status analysis of the integrated physical education in Hong Kong elementary schools. Asian Journal of Exercise & Sports Science, 2010; 7: 35–41.
30. Li C, Wong N, Sum R, Yu C. Preservice teachers' mindfulness and attitudes toward students with autism spectrum disorder: The role of basic psychological needs satisfaction. Adapted Physical Activity Quarterly, 2019; 36(1): 150–163.
31. Martin K, Kudláček M. Attitudes of pre-service teachers in an Australian University towards inclusion of students with physical disabilities in general physical education programs. European Journal of Adapted Physical Activity, 2010; 3(1): 30-48.
32. Melekoğlu MA. Examining the impact of interaction project with students with special needs on development of positive attitude and awareness of general education teachers towards inclusion. Educational Sciences: Theory and Practice, 2013; 13(2): 1053-1077.
33. Metin N, Güleç H, Şahin Ç. Examining the competencies of primary school teachers after in-service training for the integration of intellectual disabled children. I. International Turkey Educational Research Congress, Çanakkale. 2009.
34. Moroz A, Gonzales-Ramos G, Festinger T, Langer K, Zefferino S, Kalet A. Immediate and follow-up effects of a brief disability curriculum on disability knowledge and attitudes of PM&R residents: A comparison group trial. Medical Teacher, 2010; 32: 360–364. doi:10.3109/0142159X.2010.490602
35. Nalbant S. Physical educators' attitude toward teaching students with special educational needs. Journal of Physical Education and Sports Studies, 2018; 10(2): 113-121.
36. Özer D. Physical education and sports for the disabled. 5. Ed. Nobel Publishing, 2017.
37. Özyürek M. Attitudes and changing attitudes towards those affected by disability. 5. Ed. Kök Publishing, 2013.
38. Reina R, Hutzler Y, Iniguez-Santiago M, Moreno-Murcia J. Student attitudes toward inclusion in physical education: The impact of ability beliefs, gender, and previous experiences. Adapted Physical Activity Quarterly, 2019; 36(1): 132–149.
39. Reina R, L´opez V, Jiménez M, García-Calvo T, Hutzler Y. Effects of awareness interventions on children's attitudes toward peers with a visual impairment. International Journal of Rehabilitation Research, 2011; 34(3): 243–248. doi:10.1097/MRR.0b013e3283487f49
40. Rizzo TL. Attributes related to teachers' attitudes. Perceptual and Motor Skills, 1985; 60(3): 739-742.
41. Rizzo TL, Kirkendall DR. Teaching students with mild disabilities: What affects attitudes of future physical educators? Adapted Physical Activity Quarterly, 1995; 12(3): 205-216.
42. Sarı HY, Bektaş M, Altıparmak S. Determination of nursing students' attitudes towards disabled people. New Medical Journal, 2010; 27(2): 80-83.
43. Scruggs TE, Mastropieri MA. Teacher perceptions of mainstreaming/inclusion, 1958-1995: A research synthesis. Exceptional Children, 1996; 63(1): 59-74.
44. Sezer F. Preventive guidance work towards people with disabilities to developing a positive attitude; an experimental application. Education Sciences, 2012; 7(1): 16-26.
45. Shank MD. Sport marketing: A strategic perspective. Prentice Hall, 2002.
46. Sherrill C. Adapted physical activity, recreation, and sport: Crossdisciplinary and lifespan. 6th Ed. McGraw Hill, 2004.
47. Smadi A. Attitudes of administrators of sports activities toward the participation of students with disabilities in sports activities in the Jordanian universities. Al-Istiqlal University Research Journal, 2016; 1(2): 191-208.
48. Stachura K, Garven F. Comparison of occupational therapy and physiotherapy students' attitudes towards people with disabilities. Physiotherapy, 2003; 89(11): 653-664.
49. Şahin F, Güldenoğlu B. Investigation the effects of a special education training program on attitudes toward people with disabilities. Amasya Educational Journal, 2013; 2(1): 214-239.
50. Şahin H, Akyol AD. Evaluation of nursing and medical students' attitudes towards people with disabilities. Journal of Clinical Nursing, 2010; 19: 2271–2279. doi:10.1111/j.1365-2702.2009.03088.x
51. Tant M, Watelain E. Forty years later, a systematic literature review on inclusion in physical education (1975–2015): A teacher perspective. Educational Research Review, 2016; 19: 1-17.
52. Tavil YZ, Özyürek M. The effect of realistic information and interaction on the change of special education teacher candidates' attitudes towards people with disabilities. Ekev Akademy Journal, 2009; 13(39): 265-276.
53. Tervo RC, Azuma S, Palmer G, Redinius P. Medical students attitudes toward persons with disability: A comparative

study. Archives of Physical Medicine and Rehabilitation, 2002; 83: 1537– 1542. doi:10.1053/apmr.2002.34620

54. Tervo RC, Palmer G, Redinius P. Health professional student attitudes towards people with disability. Clinical Rehabilitation, 2004; 18: 908–915. doi:10.1191/0269215504cr820oa
55. Thompson TL, Emrich K, Moore G. The effect of curriculum on the attitudes of nursing students toward disability. Rehabilitation Nursing, 2003; 28(1): 27-30. doi:10.1002/j.2048-7940.2003.tb01718.x
56. Tripp A, Sherrill C. Attitude theories of relevance to adapted physical education. Adapted Physical Activity Quarterly, 1991; 8(1): 12-27.
57. Yuker HE, Block JR, Young JH. The measurement of attitudes towards disabled persons scale. Ina Mend Instution, 1970.

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Evaluation Of Participation In Recreational Exercise With Basic Psychological Needs And Happiness Parameters During The COVID-19 Pandemic Process

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Abstract

This cross-sectional study aimed to characterize the basic psychological needs of individuals participating in recreational exercises during coronavirus disease process (COVID-19) and to evaluate their level of happiness. A total of 182 adults (26 ± 6.13 years; 50.5% male, 49.5 female) and individuals who attended private gyms during the pandemic process participated in the study. The demographic information form created by the researchers in the study, "Basic Psychological Needs in Exercise Scale" (31,32) and "Oxford Happiness Scale-Short Form" (18, 11) were used. As a result of the study, while there was no difference in the basic psychological needs scale (BPNES) and its sub-dimensions in exercise according to gender, a significant difference was found in favor of male participants ($t = -4.344$; $p < 0.01$) in the happiness scale. When evaluated according to age, no significant difference was observed in the happiness scale, while a significant difference was found in the sufficiency and autonomy sub-dimensions of the BPNES in favor of 33 years and over compared to age 21 and below. As a result of this study, it has been revealed that autonomy and competence are the primary needs that motivate individuals to exercise during the pandemic period. It has been confirmed that especially adult groups attach greater importance to these needs. The importance of internal regulators in dealing with obstacles in the period when pandemic can be seen as an obstacle to participation in recreational exercise has been demonstrated.

Key words: Pandemic, Recreational exercise, Sport,

INTRODUCTION

The Covid-19 enfection, which WHO describes as a pandemic in 2020, continues to affect the whole world (31, 38). With the "stay at home" motto that national and international measures focus on, individuals have remained away from social and physical activities. The limitation of sports and exercise areas in the service class that will continue, the increase in the epidemic dimension and the psychological effects of individuals in this process have led to the formation of sedentary life (17). It is possible to explain the risks of this period with studies examining the effect of inactivity on the muscle, cardiovascular, metabolic, endocrine and nervous systems (26). In addition to these systems, it is revealed that they also affect the psychological states of individuals. Lim (23), "The shutting down of gyms, swimming pools, and fitness centers, postponement of sporting events, and closure of non-emergency physical therapy services, along with the practice of self-isolation, quarantine, and social distancing, as well as restrictions on outdoor activities and exercises, could eventually have physical, psychological, and behavioral consequences to the population. " has reported as this process.

Inactivity and related deaths are reported to exceed three million. For example, it is recommended that adults aged between 18 and 64 years, the age group most affected by COVID-19 according to recent

statistics (i.e. accounting for over 70% of all severe cases) (35) should engage in weekly training of at least 150 min of moderate-intensity physical activity or 75 min of vigorous-intensity physical activity, or a corresponding combination of moderate- and vigorous-intensity activity (33). Recent evidences also attest to the benefits of regular physical activity on survival (29, 12). With the increasing awareness of social distance and isolation during the Covid-19 pandemic process, individuals have adapted to the forced restricted area. The fact that these limited areas (home, workplace, etc.) are not suitable for exercise and recreational activity has restricted individuals with a lack of motivation during the pandemic period, even if we already have a routine of exercise or physical activity.

Considering the possible consequences that this period of social isolation may have on the levels of stress and anxiety (7), the WHO emitted a set of deliberations to minimize its effects. Among other measures, the need to restrict the time spent watching COVID-19 news and to seek reliable information in official media was highlighted, along with the need to maintain family routines and to seek a healthy lifestyle, namely through regular physical activity, healthy eating and regular sleep routines (34) Psychological well-being can be predicted by the degree of satisfaction of three basic psychological needs, autonomy (i.e., the subject's ability to regulate his or her own actions), competence (i.e., the subject's efficiency in interacting with the environment) and relatedness (i.e., the subject's ability to search for and develop connections and interpersonal relationships), according to the theory of basic psychological needs (9, 2). Present researchs has shown, well-being is understood as consisting of hedonic as well as eudaimonic aspects. It therefore include both positive emotion (such as happiness) and intrinsic learning motivation, to operationalise human psychological well-being. Based on previous findings, would be assume that all three basic needs, namely competence, autonomy and relatedness, relate to positive emotion and intrinsic learning motivation (19).

Exercise and sports activities yield a favorable health and mental impact when performed in moderation (23, 24).Regular exercise enhances rather than suppresses the immune response in individuals of all ages and a physically active lifestyle may delay or limit the aging of the immune system, leading to a reduced risk of contracting communicable diseases (e.g. viral and bacterial infections) and non-communicable diseases (e.g. diabetes, hypertension, and cancer) (6). Reductions in physical activity may also affect one's mental health, which may be experienced as unpleasant emotions such as sadness, anger, frustration and/or irritation. In a review on psychological impact of quarantine recently performed by Brooks et al., the authors stated that experiencing disease outbreaks can trigger symptoms of post-traumatic stress, depression and/or confusion, among others (25).

MATERIAL AND METHOD

Study design

Permission was obtained from the Selcuk University ethics committee before the study began (Ethics committee approval no=E-40990478-050.99-34874). In this study conducted on the basis of survey model; the data collection tools used in the study were filled face to face in the exercise hall. Detailed information about the study was given to all volunteers. An informed consent form was obtained from participants who volunteered to participate in the study.

Participants

This study Covid-19 pandemic period, the Ministry of Internal Affairs of the Republic of Turkey participated in individuals who continue to exercise restraint according to the hall. The sample of the study was determined by the convenient sampling method, which is one of the non-random sampling types (5). A research was conducted with 182 people (90 women, 92 men) who voluntarily participated in the study in two private sports halls in Selçuklu district of Konya province, which is active in 2020 and whose customer portfolio varies.

PROCEDURE

Questionnaires

Basic Psychological Needs İn Exercise Scale

It was developed by Vlachopoulos and Mchailidou (32) in order to evaluate the three basic needs of people, namely autonomy, competence and interconnectivity within the scope of self-determination theory in an exercise environment. BPNES consists of 12 items and 3 sub-dimensions (competence (α=.80), autonomy (α=.60) and being related (α=.75)). The Turkish adaptation of the scale was made by Vlachopoulos et al. (31) with an intercultural study and consists of the degrees of "Totally Disagree" (1) and "Completely Agree" (5). It

is evaluated using a 5-point Likert-type scale with a score between 1-5. The internal consistency coefficient obtained in this study is .71.

Oxford Happiness Scale Short Form

Oxford Happiness Questionnaire-Short Form (OHQ-SF) This scale was developed by Hills and Argyle (18) The scale is composed of eight items and there is .93 ($p<.001$) correlation among twenty-nine items in the original form. OHQSF was translated into Turkish by Doğan and Cötok (11). As a result of exploratory factor analysis, a single factorial structure was obtained which contains seven items, a 2.782 eigenvalue, and explains 39.74 % of the total variance. A single factorial structure of OHQ-SF was analyzed with confirmatory factor analysis and goodness of fix indices were found to be (v2/df = 2.77, AGFI = .93, GFI = .97, CFI = .95, NFI = .92, IFI = .95, RMSEA = .074). The coefficient of internal consistency for reliability of OHQ-SF was .74 and the reliability coefficient of the test–retest was .85. The internal reliability coefficient of this study was calculated as .77.

Statistical analysis

The data gathered via questionnaire was analyzed using SPSS 24 package software. In order to descriptive statistical methods were utilized in the data analysis including frequency (n), percentage (%). Fundamental assumptions regarding such analysis were assessed. For the choosing comparison tests, the normality distribution was tested in various ways. As a result of the tests, the data had shown a normal distribution, it exceeds the reference skewness-kurtosis values as -1.95/+1.95 (13). Since the data showed normal distribution, independent group t test was used for pairwise set comparisons, and One-Way Analysis of Variance (ANOVA) was used for comparisons of more than two sets. Post-hoc tests bonferroni were used to determine the difference between groups in multiple comparisons. The significance level was taken as 0.05 in the study.

RESULTS

Table 1. The characteristic of participants are given in table 1.

		N	%
Gender	Women	90	49.5
	Men	92	50.5
Age	<21	39	21.4
	22-24 age	42	23.1
	25-28 age	31	17.0
	29-32 age	35	19.2
	33<	35	19.2
Education	Primary School	27	14.8
	High School	88	48.4
	Bachelor	67	36.8
Income	<2000 tl	46	25.3
	2001-3000 tl	84	46.2
	3001 tl <	52	28.6
Total		**182**	**100**

Table 2. Compare by variables

	Basic Psychogical Needs in Exercise Scale						**Happiness Scale**	
	Competence		**Being Related**		**Autonomy**			
	X	Ss	X	Ss	X	Ss	X	Ss
Women	3.20	0.64	3.29	0.61	3.21	0.49	2.91	0.49
Men	3.22	0.58	3.22	0.49	3.27	0.42	3.21	0.42
t	-0.281		0.832		-0.627		-4.344	
p	0.77		0.40		0.53		**0.00****	
	X	**Ss**	**X**	**Ss**	**X**	**Ss**	**X**	**Ss**
<21[1]	2.97	0.62	3.11	0.60	3.05	0.40	3.05	0.40
22-24 age[2]	3.05	0.55	3.19	0.52	3.12	0.54	3.12	0.54
25-28 age[3]	3.33	0.56	3.30	0.60	2.98	0.56	2.98	0.56
29-32 age[4]	3.35	0.54	3.27	0.47	3.00	0.45	3.00	0.45
33<	3.42	0.64	3.45	0.55	3.16	0.44	3.16	0.44
F	4.305		1.904		3.829		0.904	
p	**0.00****		0.11		**0.00****		0.46	
Bonferroni	1-5				1-5			
	X	**Ss**	**X**	**Ss**	**X**	**Ss**	**X**	**Ss**
Premilary School	3.22	0.54	3.37	0.62	3.33	0.58	3.07	0.49
High School	3.19	0.62	3.22	0.54	3.25	0.60	2.98	0.44
Bachelor	3.23	0.62	3.27	0.54	3.19	0.57	3.17	0.52
F	0.094		0.749		0.534		2793	
p	0.91		0.47		0.58		0.06	
Bonferoni								
	X	**Ss**	**X**	**Ss**	**X**	**Ss**	**X**	**Ss**
<2000 tl	3.02	0.63	3.15	0.65	3.04	0.63	3.04	0.39
2001-3000 tl	3.24	0.58	3.31	0.52	3.33	0.57	3.03	0.51
3001 tl <	3.34	0.59	3.26	0.50	3.28	0.53	3.15	0.50
F	3.614		1.237		3.869		1.042	
p	**0.02***		0.29		**0.02***		0.35	
Bonferoni	1-3				1-2			

*p<0.05; **p<0.01

According to Table 2, which shows the comparison of the basic psychological needs scale and happiness scale in exercise to various variables, there is a significant difference in favor of male participants in the happiness scale by gender, and a significant difference in favor of 33 years and over compared to under 21 years in the competence and

autonomy subscales of the BPNES scale by age according to the income variable, statistically significant differences were found in the autonomy sub-dimension of the BPNES scale in favor of the participants with medium income compared to the low income group.

Table 3. Correlation Between BPNES and Happiness Scale

		Oxford Happiness Scale
Competence	r	0.117
	p	0.115
Being Related	r	0.155
	p	0.036*
Autonomy	r	0.212
	p	0.004**

*p<0.05; **p<0.01

According to Table 3, in which the relationship between BPNES and Happiness scale is questioned, there is no relationship between Competence sub-dimension and happiness scale (r = 0.117; p> 0.05), while between being related sub-dimension and happiness there is a low level of positive direction (r = 0.115; p < 0.05) and a low level of positive correlation (r = 0.212; p <0.01) between autonomy subscale and happiness scale.

DISCUSSION

The purpose of this study is to define the simple psychological needs of individuals who continue to exercise in recreational fitness centers during the covid-19 pandemic period and to reveal their relationship with happiness.The Covid-19 pandemic is a period in which the whole world is affected and its effects will be questioned for a long time. Individuals had to ignore many activities in their daily lives during this period. The area of influence and spread of the virus has increased day by day. This increase has affected individuals' attitudes towards many areas. One of the areas where this effect is felt the most is undoubtedly the exercise areas. The safety of indoor areas such as the fitness center where there is a lot of interaction continues to be questioned, even restrictions are imposed within the framework of national measures. In this context, the differences in the attitudes of individuals who continue to use fitness centers when they are open even though many people are away from activities and activities are questionable. It is possible to explain physical activity and recreational activities with psychological processes and emotional states. Basic psychological needs in exercise participation have already been defined. However, the literature should be enriched in order to reveal which need is defined by exercise participation during the pandemic period. It should be based on determining the infrastructure of the need to participate in exercise and recreational activities even in the most risky periods and the diversity and quality of the services to be offered to individuals.As a result of our study, the happiness levels of men who attend recreational fitness centers were found to be higher than women. According to the data we evaluate Turkey Statistical Institute in 2020, overall happiness and life satisfaction has fallen 4%. In addition, TSI data indicates that the general happiness level of women is higher, while the rate of men who declared that they are happy was 43.2% in 2020, while it was 47.6% in 2019. For women, this rate was 57.0% in 2019 and 53.1% in 2020. Similarly, when the literature is examined, women have a high level of happiness (30). Considering the sample of our study specifically for individuals who exercise, an important factor of exercise participation is the happiness parameter. The reason why this parameter is high in racial participants can be explained by the goal theory. When the studies based on the theory of goal to be achieved were examined (10,1), It was found that women's motivation to participate in sports such as health and body perception was high, while men's more self-confidence and motivation to participate for success were higher (24). The exceptional situation experienced in this period may contribute to a lower perception of satisfaction of competence, particularly in the female gender, mostly due to changes in the usual routine, namely regarding activities that may provide greater interaction with the environment and that may help experience a better satisfaction of this psychological basic need (2, 17).There is a significant difference in the

competence and autonomy subscales of the BPNES by age scale in favor of the age of 33 and over when compared to the under 21 age group. Competence; The individual's judgment about himself / herself about how successful he / she can be in overcoming difficult situations that he / she may face in the present and the future is his belief (37,39). Studies have emphasized that young people have difficulties in managing mental processes and their anxiety rates increase during the pandemic period (20, 36, 4, 16). This supports the results in favor of adults in our study. The management of internal processes, in which experience and control mechanisms will be supported, and the response to extraordinary situations and evolving needs will vary (15,21). In this context, recreational activity and physical activity, which can be considered as an external coping strategy during the pandemic process, can also be seen as an important parameter in the protection of mental and physical health. On the other hand, the significant difference in favor of 33 years and over in the autonomy sub-dimension can be explained by self-regulation theory. While the needs and expectations of young individuals may be more superficial (28), the source of adult individuals' motivation and need for exercise is explained by the concepts of internal regulation and self-determination (14). Considering the studies based on all these theories and practices, the motivations and needs of individuals to participate in recreational exercises during the pandemic period can be considered as the desire to take part freely in environments where they can express themselves and feel belonging.

CONCLUSION

With the COVID-19 disease, which started in the first half of 2020 and continues to affect today, the social lives of individuals have been greatly affected. This effect has also affected physical and mental health, especially with the effective implementation of the "stay at home" principles as a result of national measures (8). In this process, it has been reported that individuals are more adapted to inactive life (27). When we look at the current number of cases and related death rates, it is understood that the virus poses a great risk especially for people with weak immune systems and various chronic diseases. Among the main elements of the weak immune system and various chronic diseases; It is known that the vast majority of them, such as high blood pressure and diabetes, are caused by inactivity (sedentary life) (3).

In our study, simple psychological needs and happiness parameters during exercise were evaluated specifically for individuals who continued exercising during the pandemic period. As a result of this evaluation, it has been revealed that autonomy and competence are the primary needs that motivate individuals to exercise during the pandemic period. It has been confirmed that especially adult groups attach greater importance to these needs. The importance of internal regulators in dealing with obstacles in the period when pandemic can be seen as an obstacle to participation in recreational exercise has been demonstrated once again.

When the studies are examined, the scarcity of studies investigating the importance and effects of exercise during the pandemic period is seen as a limitation to discuss the study. The direction of the studies is increasing especially for elite athletes. Elite athletes have had the opportunity to access many social support and regulations in this process. However, it is thought that individuals participating in recreational exercise and sedentary individuals are more affected by this period. Increasing studies are important in evaluating the measures that can be applied and developing solutions for inactivity.

REFERENCES

1. Allport GW, Vernon PE, ve Lindzey G. Study of values. Oxford, England: Houghton Mifflin, 1960.
2. Antunes R, Frontini R, Amaro N, Salvador R, Matos R, Morouço P, & Rebelo-Gonçalves R. Exploring lifestyle habits, physical activity, anxiety and basic psychological needs in a sample of Portuguese adults during COVID-19. International journal of environmental research and public health, 17(12), 4360. 2020
3. Aslan R. Tarihten Günümüze Epidemiler, Pandemiler ve Covid-19. Ayrıntı Dergisi, 8(85). 2020.
4. Bueno-Notivol J, Gracia-García P, Olaya B, Lasheras I, López-Antón R, & Santabárbara J. Prevalence of depression during the COVID-19 outbreak: A meta-analysis of community-based studies. International journal of clinical and health psychology, 21(1), 100196. 2021.
5. Büyüköztürk Ş, Çakmak EK, Akgün ÖE, Karadeniz Ş, & Demirel F. Bilimsel araştırma yöntemleri. Pegem Atıf İndeksi, 2017, 1-360. 2017.
6. Campbell JP, & Turner JE. Debunking the myth of exercise-induced immune suppression: Redefining the impact of exercise on immunological health across the lifespan. Frontiers in Immunology , 9, 648,2018. https://doi.org/10.3389/fimmu.2018.00648
7. Cantarero K, van Tilburg WA, & Smoktunowicz E. Affirming basic psychological needs promotes mental well-being during the COVID-19 outbreak. Social Psychological and Personality Science, 2021, 12(5), 821-828.
8. Chen P, Mao L, Nassis GP, Harmer P, Ainsworth BE, Li F. Coronavirus disease (COVID-19): The need to maintain

regular physical activity while taking precautions. J Sport Health Sci. 2020; 9 (2): 103-4.
9. Deci EL, Ryan RM. The "What" and "Why" of Goal Pursuits: Human Needs and the Self-Determination of Behavior. Psychol. Inq. 2000, 11, 227–268
10. Dilmaç B, Ertekin E, ve Yazıcı E. Değer Tercihleri ile Öğrenme Stilleri Arasındaki İlişkinin İncelenmesi. Değerler Eğitimi Dergisi, 2009, 7(17), 27-47.
11. Doğan T, & Çötok N. Adaptation of the Short Form of the Oxford Happiness Questionnaire into Turkish: A Validity and Reliability Study . Turkish Psychological Counseling and Guidance Journal 2011, 4 (36) , 165-170 . Retrieved from https://dergipark.org.tr/tr/pub/tpdrd/issue/21456/229762
12. Engeseth K, Prestgaard EE, Mariampillai JE, et al. Physical fitness is a modifiable predictor of early cardiovascular death: A 35-year follow-up study of 2014 healthy middle-aged men. Eur J Prev Cardiol 2018; 25: 1655–1663.
13. George D, Mallery M. SPSS for Windows Step by Step: A Simple Guide and Reference, 17.0 update (10 aed.) Boston: Pearson. 2010.
14. Gillet N, Berjot S, Vallerand RJ, Amoura S. The role of autonomy support and motivation in the prediction of interest and dropout intentions in sport and education settings. Basic and Applied Social Psychology, 2012,34(3), 278-286.
15. Gualano MR, Lo Moro G, Voglino G, Bert F, & Siliquini R. Effects of Covid-19 lockdown on mental health and sleep disturbances in Italy. International journal of environmental research and public health, 2020,17(13), 4779.
16. Haider II, Tiwana F, & Tahir SM. Impact of the COVID-19 pandemic on adult mental health. Pakistan Journal of Medical Sciences, 2020, 36(COVID19-S4), S90.
17. Hammami A, Harrabi B, Mohr M, Krustrup P. Physical activity and coronavirus disease 2019 (COVID-19): Specific recommendations for home-based physical training. Manag. Sport Leis. 2020, 1–6
18. Hills P, & Argyle M. The Oxford Happiness Questionnaire: a compact scale for the measurement of psychological well-being. Personality and Individual Differences 2002,33, 1073–1082.
19. Holzer J, Lüftenegger M, Käser U, Korlat S, Pelikan E, Schultze-Krumbholz A, ... & Schober B. Students' basic needs and well-being during the COVID-19 pandemic: A two-country study of basic psychological need satisfaction, intrinsic learning motivation, positive emotion and the moderating role of self-regulated learning. International Journal of Psychology. 2021
20. Huang Y, Zhao N. Çin'de COVID-19 salgını sırasında yaygın anksiyete bozukluğu, depresif semptomlar ve uyku kalitesi: Web tabanlı bir kesitsel anket. Psikiyatrist. Araş. 2020 , 288 , 1-18.
21. Husky MM, Kovess-Masfety V, Swendsen JD. Stress and anxiety among university students in France during Covid-19 mandatory confinement. Comprehensive Psychiatry, 2020, 102, 152191.
22. Lim MA. Exercise addiction and COVID-19-associated restrictions. Journal of Mental Health. 2020.
23. Lim MA & Pranata R. Sports activities during any pandemic lockdown. Irish Journal of Medical Science (1971) . https://doi.org/10.1007/s11845-020-02300-9
24. Lima Y, Denerel N, Öz ND, & Senisik S. The psychological impact of COVID-19 infection on athletes: example of professional male football players, Science and Medicine in Football, 2021. DOI: 10.1080/24733938.2021.1933156
25. Lippi G, Henry BM, & Sanchis-Gomar F. Physical inactivity and cardiovascular disease at the time of coronavirus disease 2019 (COVID-19). European Journal of Preventive Cardiology, 2020, 27(9), 906-908.
26. Narici, M, De Vito G, Franchi M, Paoli A, Moro T, Marcolin, G., ... & Maganaris C. Impact of sedentarism due to the COVID-19 home confinement on neuromuscular, cardiovascular and metabolic health: Physiological and pathophysiological implications and recommendations for physical and nutritional countermeasures. European journal of sport science, 2020,1-22.
27. Rahmati-Ahmadabad S, Hosseini F. Exercise against SARS-CoV-2 (COVID-19): Does workout intensity matter? (A mini review of some indirect evidence related to obesity). Obes Med. 2020; 100245. DOI: 10.1016/j.obmed.2020.100245
28. Ryan RM, Deci EL. Intrinsic and extrinsic motivations: Classic definitions and new directions. Contemporary educational psychology, 2000,25(1), 54-67.
29. Tiberi M and Piepoli MF. Regular physical activity only associated with low sedentary time increases survival in post myocardial infarction patient. Eur J Prev Cardiol 2019; 26: 94–96.
30. TUIK, 2020. https://data.tuik.gov.tr/Bulten/Index?p=Yasam-Memnuniyeti-Arastirmasi-2020-37209
31. Vlachopoulos PS, AşçI FH, Cıd L, Ersöz G, Cutre D, Murcıa JA, Moutao J. Cross-cultural invariance of the basic psychological needs in exercise scale andneed satisfaction latent mean differences among Greek, Spanish, Portuguese and Turkish samples. Psychology of Sport and Exercise, 2013, 14, 622-631.
32. Vlachopoulos PS, Mıchaılıdou S. Development and initial validation of a measure of autonomy, competence, and relatedness in exercise: The basic psychological needs in exercise scale. Measurement in Physical Education and Exercise Science, 2006, 10(3):179–201.
33. World Health Organization. Physical activity, https:// www.who.int/news-room/fact-sheets/detail/physical-activ ity (2018, accessed 2021).
34. World Health Organization. Mental Health and Psychosocial Considerations during the COVID-19 Outbreak–18 March 2020; World Health Organization: Geneva, Switzerland, 2020.
35. Wu Z and McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID19) outbreak in China: Summary of a report of 72314 cases from the Chinese Center for Disease Control and Prevention. JAMA. Epub ahead of print 24 February 2020. DOI: 10.1001/jama.2020.2648.
36. Xiong J, Lipsitz O, Nasri F, Lui L. M, Gill H, Phan L, ... & McIntyre,RS. Impact of COVID-19 pandemic on mental health in the general population: A systematic review. Journal of affective disorders. 2020.
37. Yeşilyaprak B. Gelişim ve Öğrenme Psikolojisi,1. Baskı, Pegem A yayımcılık, s.199-200, Ankara. 2002.
38. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, Zhao X, Hua ng B, Shi W, Lu R, Niu P, Zhan F, Ma X, Wang D, Xu W, Wu G, Gao GF, & Tan W. A novel coronavirus from patients with Pneumonia in China, 2019. New England Journal of Medicine, 2020;382(8), 727733. Https://doi.org/10.1056/nejmoa 2001017
39. Zülkadiroğlu Z, Budak D, Kozanoğlu E. Yetkinlik Beklentisinin Spor Ve Fiziksel Aktivitedeki Önemi . Spormetre Beden Eğitimi ve Spor Bilimleri Dergisi 2007, 5 (1) , 9-15 . DOI: 10.1501/Sporm_0000000125

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Distribution of Dopamine Receptor 2 DRD2 rs1800497 Polymorphisms in Professional Football Players: A pilot study

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Abstract

Previous studies have identified that genetic variation is a significant determinant of physical activity-related behaviors and for sport enthusiasm. Dopamine receptor genes have been linked to a higher degree of overall physical activity. The dopamine receptor D2 (DRD2) rs1800497 polymorphism affects the brain's dopaminergic system and athletic performance. However, little research has been done on the connection between DRD2 and sports participation, and the few studies that have been published are contradictory. This study aimed to determine the genotype and allele distributions of the DRD2 rs1800497 polymorphism in football players and compare them with the control group. For this purpose, 21 football players and 52 participants for control group were enrolled in our study. Genotyping was performed by PCR after DNAs were isolated from buccal epithelial cells. When we examined the genotype distributions, the AG and GG were found as 5 (24%) and 16 (76%), respectively. No AA genotype was found for DRD2. When allelic distributions were examined in the athlete group, the A allele was counted as 5 (12%) and the G allele as 37 (88%). In the control group, allelic distributions for A allele and G allele were 36 (%35), 68 (%65), in respectively. As we expected, in our study cohort, the DRD2 rs1800497 polymorphism was found to be dominated by the GG genotype and the G allele. However, we found no statistically significant differences between athlete and control group. Despite the limited sample size, the findings of this study may serve as a foundation for a larger study and point the way for future studies. Therefore, further studies with athletes from different branches and with larger study group are needed to reveal the effect of DRD2 rs1800497 polymorphism on athletic performance and physical activity-related behaviours.

Key words: Sports, Genetics, Polymorphism, DRD2, Football

Profesyonel Futbolcularda Dopamin Reseptörü 2 DRD2 rs1800497 Polimorfizmlerinin Dağılımı : Pilot çalışma

Özet

Daha önce yapılan çalışmalar, genetik varyasyonun fiziksel aktivite ile ilgili davranışların ve spor yapma isteğinin önemli bir belirleyicisi olduğunu belirlemiştir. Dopamin reseptör genleri, daha yüksek seviyede bir fiziksel aktivite derecesi ile ilişkilendirilmiştir. Dopamin reseptörü D2 (DRD2) rs1800497 polimorfizmi, beynin dopaminerjik sistemini ve atletik performansı etkiler. Bununla birlikte, DRD2 ile spor katılımı arasındaki bağlantı üzerine çok az araştırma yapılmıştır ve yayınlanan çalışmalar birbiriyle çelişkilidir. Bu çalışmada DRD2 rs1800497 polimorfizminin futbolcularda genotip ve allel dağılımlarının belirlenmesi ve kontrol grubu ile karşılaştırılması amaçlanmıştır. Bu amaçla 21 futbolcu ve kontrol grubu için 56 katılımcı çalışmamıza alınmıştır. Bukkal epitel hücrelerinden izole edilen DNA'lardan PCR yöntemi ile genotipleme gerçekleştirildi. Genotip dağılımlarını incelediğimizde AG ve GG sırasıyla 5 (% 24) ve 16 (% 76) olarak bulundu. DRD2 için AA genotipi bulunamadı. Atlet grubunda allelik dağılımlar incelendiğinde, A alleli 5 (% 12) ve G alleli 37 (% 88) olarak sayıldı. Kontrol grubunda ise A alleli ve G alleli sırasıyla 36 (%35), 68 (%65) olarak bulunmuştur. Çalışma kohortumuzda, beklediğimiz gibi, profesyonel futbolcularda DRD2 rs1800497 polimorfizminin GG genotipi ve G alelinin baskın olduğunu tespit ettik. Bununla birlikte, sporcu ve kontrol grubu arasında anlamlı bir farklılık bulamadık. Sınırlı örneklem büyüklüğüne rağmen, çalışmamızın bulguları daha kapsamlı bir çalışma için temel oluşturabilir ve gelecekteki çalışmalara yol gösterebilir. Bu nedenle, DRD2 rs1800497 polimorfizminin atletik performans ve fiziksel aktivite ile ilgili davranışlar üzerindeki etkisini ortaya çıkarmak için farklı branşlardan sporculardan oluşan ve örneklem sayısı daha yüksek olan çalışmalara ihtiyaç vardır.

Anahtar kelimeler: Spor, Genetik, Polimorfizm, DRD2, Futbol

INTRODUCTION

Athletic performance is a combination of various environmental factors, including nutritional and psychological factors, as well as inherent genetic factors and is an important component of athletes (5). Sports genetics, which studies the functioning and regulation of genes that affect athletic performance, has been accepted as a new branch of science (25). The aim of sports genetics studies includes the determination of gene polymorphisms that affect athletic performance, determination of molecular mechanisms regulated by these genes, such as ACE, ACTN3, COL1A1, and determination of predispositions to enhanced athletic performance (24,2).

Neurotransmitter substances such as serotonin, dopamine, and the genes that metabolize them are important in determining the effect of psychological factors on athletes (8).

In the late 1950s, dopamine was defined as a neurotransmitter of the dopaminergic system (12). Dopamine is a neurotransmitter of the Central Nervous System (CNS) that plays a crucial role in regulating various processes such as motor control, cognition, emotion, reward, and cardiovascular regulation (9, 13). Dopamine has emotional, cognitive and sensory-motor functions as it includes the limbic system. Consequently, dopamine is associated with the control of pleasant emotions, reward, and drug addiction (16). The dopaminergic reward system is associated with obesity as well as alcohol, sex, and gambling addictions. In addition, the dopaminergic reward system plays a critical role in neuropsychiatric disorders such as schizophrenia and attention deficit hyperactivity disorder (ADHD) (3, 21).

Dopamine is the primary endogenous ligand for dopamine receptors. There are five different types of dopamine receptors, DRD1, DRD2, DRD3, DRD4 and DRD5 (10). The dopamine D2 receptor gene (DRD2) is a candidate gene for the level of physical activity due to its role in motion control as well as reward mechanisms (7, 22). The rs1800497 polymorphism G>A conversion is also known as TaqIA (or Taq1A). The G allele in the DRD2 rs1800497 polymorphism is considered the wild type, while the A allele is considered the polymorphic allele. The A allele is associated with fewer dopamine binding sites in the brain and is thought to play a role in alcohol dependence, smoking, and some neuropsychiatric disorders (23). In animal study showed that in comparison to wild-type mice, D2 dopamine receptor (DRD2) knockout mice had lower locomotor activity (15). In different animal study also presented that DRD2 expression was higher in mice for high levels of activity compared to the control group (4). In humans, De Moor et al. revealed that there was no connection between DRD2 and leisure-time physical activity (6). Another research group found no significant differences between physical performance and DRD2 gene (14).

However, little research has been done on the connection between DRD2 and sports participation and eagerness, and the few studies that have been published are contradictory. This study aimed to determine the distribution of the dopamine receptor 2 (DRD2) rs1800497 polymorphism in professional football players and to compare the results with sedentary individuals. Therefore, we hypothesized that sports enthusiasm and athletic performance are related to the mechanism of addiction.

METHOD

Study subjects

21 football players participated in the study with 52 sedentary individuals acting as a control group. Physical characteristics of the participants are represented in Table 1. None of the volunteers had transmitted genetic anomalies. The study protocol was approved by the Uskudar University Ethical Committee and performed following the principles of the Declaration of Helsinki II (26). Before the study, all the football players signed consent forms

Containing relevant information such as the study protocol and the intended use and evaluation of the results.

Physical activity level of the participants

Football players cohort had a four times/week at least each with 100-110 min. training sections and needless to say every weekend they had game day performance. For the sedantery group they had an average of two days /week, with 30 min. walking activity.

Table 1. Physical characteristics of study participants

	N	AGE (Year)		HEIGHT (cm)		WEIGHT (Kg)		BMI (Kg/m2)	
		AVG	SD	AVG	SD	AVG	SD	AVG	SD
Study Group	21	20,14	±1,424	173,1	±5,440	66,95	±5,454	22,40	±2,191
Control Group	52	27,23	±5,29	169,8	±10,69	73,92	±15,07	26,04	±6,057

Genotyping

DNA isolations from the buccal cells of the athletes participating in the study were performed with a commercially obtained PureLink DNA isolation kit (Invitrogen, Thermo Fisher Scientific, Inc.). Genotyping of the DRD2 rs1800497 polymorphism was performed using Real-Time PCR on a StepOnePlus (Thermo Fisher Scientific, Inc.) device and Taqman SNP Genotyping Assays genotyping kits according to the manufacturers' protocols (cat. no. 4362691, Thermo Fisher Scientific, Inc.). G and A alleles were determined using VIC and FAM primers, respectively (Fig. 1). For a total volume of 10 µl reaction, 5 µl of Genotyping Master Mix (Applied Biosystems, Foster City, CA), 3.5 µl of nuclease-free H2O (Thermofisher, USA), 0.5 µl of genotyping test (Applied Biosystems), and 1 µl of DNA were used. The sequences of the TaqMan Probe used for genotyping are listed in Figure 2.

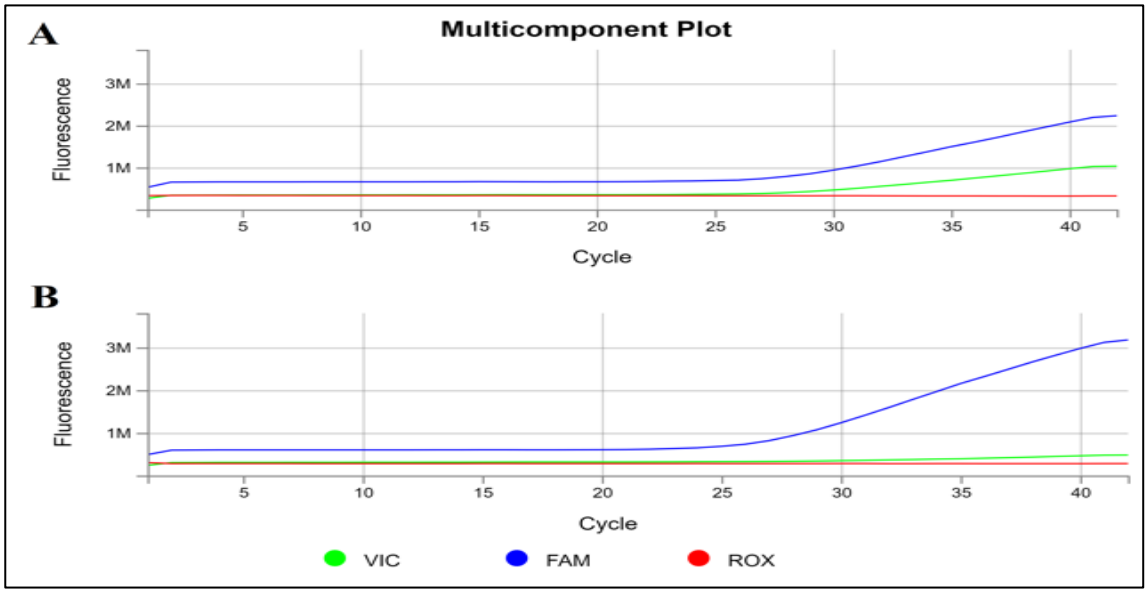

Figure 1. Quantitative PCR amplification of the AG genotype and GG genotype of DRD2 rs1800497 polymorphism. FAM indicates the G allele (blue curve), whereas VIC (green curve) indicates the A allele. (A) The single blue curve indicates the homozygous genotype of GG, whereas (B) the blue and green curves indicate the heterozygous genotype of AG.

Statistical analysis

In our study, all the athletes and sedentary individuals were compared in terms of both genotype and allelic distribution. Comparison processes were carried out using SPSS (version 18.0 for Windows, SPSS, Chicago, IL, USA) by χ^2 analysis. P <0.05 value was accepted as statistically significant

qPCR	Sequence, 5'-3'
VIC/FAM	CACAGCCATCCTCAAAGTGCTGGTC[A/G]AGGCAGGCGCCCAGCTGGACGTCCA

Figure 2. Sequences of the TaqMan probe used for genotyping DRD2 rs1800497 polymorphism.

RESULT

In the DRD2 analysis, it was determined that 16 (76%) out of 21 players had GG, and 5 (24%) of them had the AG genotype. No AA genotype was found for DRD2. When allele distributions were examined, it was observed that the percentages were 12% for A allele and 88% for G allele. In the control group (n = 52), 9 individuals had AA, 18 individuals had AG and 25 individuals had GG genotypes. A allele was counted as 36 (35%) and G allele as 68 (35%). The genotype and allele number distributions of the athletes are summarized in Table 1.

Table 2. Genotypic and allelic distribution of the DRD2 rs1800497 in the examined football players.

	Genotype			p Value	Allelic Frequency		p Value
	AA	**AG**	**GG**		**A**	**G**	
Athlete (21)	-	5	16		5	37	
Percentage	0%	24%	76%		12%	88%	
Control (52)	9	18	25	0,0430	36	68	0,0057
Percentage	17%	35%	48%		35%	65%	

◎ Significance was assessed at least at the p <0.05 level. Comparison with the control group was made using the x2 test.

DISCUSSION

Addiction or addiction tendency can affect athletic performance. DRD2 deficiency may cause individuals to have higher risk of multiple addictive, impulsive, and compulsive behaviors (19). High dopamine levels can lead to mental disorders related to abnormal brain function (18). The A allele of the DRD2 rs1800497 polymorphism is thought to be associated with addiction (17).

Dopamine is the primary binding ligand for dopamine receptors and there are five different dopamine receptors, DRD1, DRD2, DRD3, DRD4, and DRD5. It has been reported that the number of DRD2 receptors in neuronal membranes is higher in the GG genotype, while it is lower in the AA genotype (11). In our cohort, AG and GG genotypes were found as 5 (24%) and 16 (76%), respectively. A and G allele numbers were 5 (12%) and 37 (88%) in our athlete group.

There are limited numbers of studies investigating the relationship between the DRD2 rs1800497 polymorphism and sports performance. Yüksel et al. investigated the DRD2 rs1800497 polymorphism in volleyball players and bodybuilders. All volleyball players in the study group were found to be in the GG genotype. It has been observed that the addiction-related A allele is less common in volleyball players and bodybuilders (27). Özcan et al. investigated the DRD2 rs1800497 polymorphism and found that the GG genotype and G allele were higher in sprinter and endurance athletes. None of the athletes carried the A Allele, which is related to addiction compared to the G Allele (20). Abe et al. examined COMT, DRD2, and DRD3 polymorphisms, which are thought to affect dopaminergic nerve functions, in swimmers. In their studies, the frequency of the AA genotype was lower than the other genotypes, and the AG genotype was higher than the GG genotype (1).

In our study, the GG genotype was higher than the GA genotype and no AA genotype was found in athletic group. At the same time, when we compared the G allele with the A allele, it was found that the G allele was higher in percentage terms. Our findings are similar to those of previous studies. According to our results G allele was dominant in the both study group. Therefore, we found no statistically significant differences between the professional football players and control group. We think that small sample study group could be the reason of similar allelic distribution of control and athletic groups . Despite the small number of participants, results of our study may be the preliminary report for a larger study in the future .

CONFLICT OF INTEREST

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. No funding was received.

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REFERENCES

1. Abe D, Doi H, Asai T, Kimura M, Wada T, Takahashi Y, Matsumoto T, Shinohara K. Association between COMT Val158Met polymorphism and competition results of competitive swimmers. Journal of Sports Science and Medicine. 2017; 36(4): 393-397. doi: 10.1080/02640414.2017.1309058
2. Aslan BT, Eken BF, Kaman T, Sercan C, Ulucan K. Collagen type I alpha 1 (COL1A1) rs1800012 polymorphism in cyclists . Pamukkale Journal of Sport Sciences. 2020; 11(2): 1-4.
3. Berridge KC. Is Addiction a Brain Disease? Neuroethics. 2017; 10(1): 29–33. doi: 10.1007/s12152-016-9286-3
4. Bronikowski AM, Rhodes JS, Garland T Jr, Prolla TA, Awad TA, Gammie SC. The evolution of gene expression in mouse hippocampus in response to selective breeding for increased locomotor activity. Evolution. 2004;58(9): 2079-2086. doi: 10.1111/j.0014-3820.2004.tb00491.x.
5. Corak A, Kapıcı S, Sercan C, Akkoç O, Ulucan K. A pilot study for determination of anxiety related SLC6A4 promoter "S" and "L" alleles in healthy Turkish athletes. Cellular and Molecular Biology (Noisy-le-grand). 2017; 63(5): 29-31. doi: 10.14715/cmb/2017.63.5.6
6. De Moor MH, Liu YJ, Boomsma DI, Li J, Hamilton JJ, Hottenga JJ, Levy S, Liu XG, Pei YF, Posthuma D, Recker RR, Sullivan PF, Wang L, Willemsen G, Yan H, De Geus EJ, Deng HW. Genome-wide association study of exercise behavior in Dutch and American adults. Medicine & Science in Sports & Exercise. 2009;41(10): 1887-1895. doi: 10.1249/MSS.0b013e3181a2f646.
7. Drago J, Padungchaichot P, Accili D, Fuchs S. Dopamine receptors and dopamine transporter in brain function and addictive behaviors: insights from targeted mouse mutants. Developmental Neuroscience. 1998; 20: 188–203. doi: 10.1159/000017313
8. Eken BF, Akpınaroglu C, Arslan KS, Sercan C, Ulucan K. Effects of genes to psychological factors in sports. The Journal of Neurobehavioral Sciences. 2018; 5(1): 56–61. doi: 10.5455/JNBS.1516796381
9. Foley TE, Fleshner EM. Neuroplasticity of Dopamine Circuits After Exercise : Implications for Central Fatigue. NeuroMolecular Medicine. 2008; 10: 67–80. doi: 10.1007/s12017-008-8032-3
10. Gingrich JA, Caron MG. Recent advances in the molecular biology of dopamine receptors. The Annual Review of Neuroscience. 1993; 16: 299-321. doi: 10.1146/annurev.ne.16.030193.001503
11. Grandy DK, Litt M, Allen L, Bunzow JR, Marchionni M, Makam H, Reed L, Magenis RE, Civelli O. The human dopamine D2 receptor gene is located on chromosome 11 at q22-q23 and identifies a TaqI RFLP. American Journal of Human Genetics. 1989; 45(5): 778-785.
12. Hornykiewicz O. The action of dopamine on the arterial pressure of the guinea pig. The British Journal of Pharmacology. 1958; 13: 91- 94. doi: 10.1111/j.1476-5381.1958.tb00197.x
13. Jaber M, Robinson SW, Missale C, Caron MG. Dopamine receptors and brain function. Neuropharmacology. 1996; 35: 1503–1519. doi: 10.1016/s0028-3908(96)00100-1
14. Jozkow P, Slowinska-Lisowska M, Laczmanski L, Medras M. DRD2 C313T and DRD4 48-bp VNTR polymorphisms and physical activity of healthy men in Lower Silesia, Poland (HALS study). Annals of Human Biology. 2013;40(2): 186-90. doi: 10.3109/03014460.2012.748829.
15. Kelly MA, Rubinstein M, Phillips TJ, Lessov CN, Burkhart-Kasch S, Zhang G, Bunzow JR, Fang Y, Gerhardt GA, Grandy DK, Low MJ. Locomotor activity in D2 dopamine receptor-deficient mice is determined by gene dosage, genetic background, and developmental adaptations. Journal of Neuroscience. 1998;18(9): 3470-3479. doi: 10.1523/JNEUROSCI.18-09-03470.1998.
16. Melis M, Greco B, Tonini R. Interplay between synaptic endocannabinoid signaling and metaplasticity in neuronal circuit function and dysfunction. European Journal of Neuroscience. 2014; 9: 1189–1201. doi: 10.1111/ejn.12501
17. Munafo MR, Matheson IJ, Flint J. Association of the DRD2 gene Taq1A polymorphism and alcoholism: a meta-analysis of case-control studies and evidence of publication bias. Molecular Psychiatry. 2007; 12: 454-461. doi: 10.1038/sj.mp.4001938
18. Ndamanisha JC, Guo L. Nonenzymatic glucose detection at ordered mesoporous carbon modified electrode. Biosensors and Bioelectronics. 2009; 23: 60- 63. doi: 10.1016/j.bioelechem.2009.05.003
19. Noble EP. Addiction and its reward process through polymorphisms of the D2 dopamine receptor gene: a review. European Psychiatry. 2000; 15: 79– 89. doi: 10.1016/s0924-9338(00)00208-x
20. Özcan ÖÖ, Sercan C, Kulaksız H, Karahan M, Ulucan K. The Effect of Dopamin D2 Receptor TAQ A1 Allele on Sprinter and Endurance Athlete. International Journal of Medical. Medicine and Health Science. 2018; 12(9): 353-356. doi: 10.5281/zenodo.1474429
21. Thompson J, Thomas N, Singleton A, Piggott ML, loyd S, Perry EK, Morris CM, Perry RH, Ferrier IN, Court JA. D2 dopamine receptor gene (DRD2) taq1 A polymorphism reduced dopamine D2 receptor bindingin the human striatum associated with A1 allele. Pharmacogenetics. 1997; 7: 479-84. doi: 10.1097/00008571-199712000-00006
22. Turner E, Ewing J, Shilling P, Smith TL, Irwin M, Schuckit M, Kelsoe JR. Lack of association between an RFLP near the D2 dopamine receptor gene and severe alcoholism. Biological Psychiatry. 1992; 31(3): 285-290. doi: 10.1016/0006-3223(92)90052-2
23. Pohjalainen T, Rinne JO, Någren K, Lehikoinen P, Anttila K, Syvälahti EKG, Hietala J. The A1 allele of the human D2 dopamine receptor gene predicts low D2 receptor availability in healthy volunteers. Molecular Psychiatry. 1998; 3: 256–260. doi: 10.1038/sj.mp.4000350
24. Polat T, Dogan CS, Dogan M, Akçay T, Ulucan K. Distribution of α - actinin - 3 rs1815739 and angiotensin - 1 converting enzyme InDel polymorphisms in Turkish bodybuilders. Biomedical Reports. 2020; 13(6): 1–5. doi: 10.3892/br.2020.1374
25. Ulucan K. Literature review of Turkish sportsmen in terms of ACTN3 R577X polymorphism. Clinical and Experimental Health Sciences. 2016; 6: 44–47. doi: 10.5152/clinexphealthsci.2016.059
26. World Medical Association. World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects. JAMA. 2013; 310(20): 2191–2194. doi: 10.1001/jama.2013.281053
27. Yüksel İ, Kapıcı S, Sercan C, Kulaksız H, Polat T, Turan G, Ulucan K. Addiction Related DRD2 gene rs 1800497 polymorphism distribution in volleyball players and bodybuilders. The Journal of Neurobehavioral Sciences. 2017; 4(3): 122-125. doi: 10.5455/JNBS.1502377893

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Effects of Upper Body Anthropometrics and Handgrip Strength on Ball Velocity in Female Handball Players

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Abstract

The aim of this study is to analyze the relationship between ball velocity thrown from two different positions, parameters of upper body anthropometrics and hand grip strength as a marker of upper body strength. Twelve well-trained female handball players (age, 22.47±4.57 years; body mass, 66.70±11.05 kg; height, 167.33±7.41 cm; handball experience, 9.91±3.47 years), playing in a team that competes in the first division of the Handball League of Turkey joined this study. Body weight, height, body mass index (BMI), body fat percent and trunk muscle mass, hand length and breadth, sitting height, arm span index and dominant hand grip strength measured by using a stadiometer, bioelectric impedance device, anthropometric set, fiberglass measuring tape and hand grip dynamometer respectively. Ball velocity was measured with a speed radar for both throwing positions (throws are made from a sitting position either with a non-throwing hand on the floor (RP) or non-throwing arm free (RS). *According to hierarchical multiple regression analysis carried out; the original contribution of fat percentage, trunk muscle mass, BMI and handgrip strength included in the model in the first step is not significant within the model and both RP and RS were not able to predict ball velocity (p>0.05). It was also determined that hand length,* hand breadth, *sitting height and* arm span index which were *included in the model in the second step were not significant and did not predict the ball velocity for both RP and RS as well (p>0.05). However, there was a positive relationship between trunk muscle mass and ball velocity with RP* (r = 0.831; p<0.05). No relationship was found between other variables and ball velocity for both RP and RS. According to the results of the study, handball players and their coaches might consider designing resistance training programs that put an emphasis on increasing trunk muscle mass to increase the ball velocity during over arm throws.

Key words: Handball, Ball velocity, Anthropometry, Strength

INTRODUCTION

Handball is a dynamic sport characterized by intensive, intermittent physical exertion such as sprinting, change of direction, jumping, throwing, blocking and pushing (9,14). It is known that handball performance is affected by the anthropometric characteristics of the athletes for the skills of jumping, running, throwing or for the physical qualities of stamina power and strength (5,10,14).

Throwing is a crucial aspect of handball, since the main objective of this sport is to get the ball into the opponent's net (20). Ball velocity, together with throwing accuracy, are key factors in successful

throwing performance (2). Efficiency of throwing depends on multiple factors such as throwing arm mechanics, coordination of sequential joint actions such as hip extension and rotation, shoulder rotation and elbow extension, as well as the strength and power of overall musculature (13).

Several previous studies (3, 20, 22-24) showed weak to moderately strong correlations of general anthropometric variables (body mass, stature, BMI) and ball-throwing velocity (r = 0.23 – 0.70). Zapartidis et al., also reported that ball velocity is positively correlated (r = 0.29–0.37) with anthropometric parameters with relevance to handball (e.g., hand size and arm span) (23). However, Shalfawi et al., argued that general anthropometric variables have almost no predictive value for athletes´ maximal throwing velocity (15). Therefore, the aim of this study is to analyze the relationship between upper body anthropometrics and handgrip strength on ball velocity with two different throwing positions (either from a sitting position with both arms free to move (RP) or non-throwing hand on the ground (RS) in female handball players.

We hypothesize that for both RP and RS: a) body fat , trunk muscle mass , BMI, handgrip strength variables combined together can predict the ball speed, b) hand length, hand breadth, sitting height and arm span index variables combined together can the predict ball velocity, c) common effect of all variables combined together can predict the ball velocity.

Table 1. Descriptive characteristics of the players

Variables	Mean ± SD (N=12)
Age (years)	22.47 ± 4.57
Body mass (kg)	66.70 ± 11.05
Height (cm)	167.33 ± 7.41
Handball experience (years)	9.91 ± 3.47
Training frequency (sessions/week)	7.75 ± 0.86
Training volume (h/week)	15.50 ± 1.73

Twelve well-trained female handball players, playing in a team that competes in the first division of the Handball League of Turkey joined this study. The Handball team finished third in previous year's competition, and they aim to be a part of Turkey's Women's Handball Super League next season. Players' characteristics are presented in table 1. The inclusion criteria were as follows: Subject should be: licensed as a professional player for at least 4 years (including the 2020–2021 handball season); age ≥18 years; apparently healthy (based on the medical examination for the 2020–2021 handball season); and have no chronic or musculoskeletal injuries in the last three months.

Procedures

All subjects underwent a set of anthropometric measurements, hand grip strength tests, and ball velocity evaluation assessment for both RS and RP. All tests were performed on the same day within the same time period (2.30–4.30 PM) at Tekirdag Namık Kemal University Sports Hall. Although the team and the players were in mid-season; they had a short break due to the COVID-19 pandemic thus allowing the tests and measurements to take place. All subjects were informed to rest well a day before the testing session and were instructed to continue their normal food consumption, fluid intake, and regular sleep patterns. However, caffeine and food intake were limited to 3 hours prior to the testing session. The order of the of tests and measurements were as follows: body mass, body composition (muscle mass and fat percentage), height measurement, sitting height measurement, arm span measurement, hand length and breadth measurement, grip strength, throws (ball velocity). To minimize the learning effect for ball throws, half of the subjects started the throws with RS, whereas other half with RP in a randomized fashion. There was a 2-min recovery period between throws and the subjects were not allowed to perform static stretching during this period. All of the subjects were instructed to wear sport shorts, short-sleeved t-shirts, and handball shoes prior to measurements. However, all anthropometric measurements were done barefoot.

Anthropometry

Body mass and body composition (muscle mass [in kg] and fat percentage %) were measured using a body composition monitor based on the bioelectric impedance method (BIA, Tanita BC 545N, Australia). Standing and sitting height were measured using a stadiometer (13539; Mesilife). Hand length and hand breadth were measured from the dominant side using an anthropometric set (HLT-100; Holtain Ltd. Crosswell, Crymych,UK). Arm span was measured using a fiberglass measuring tape. Body index (BMI) (kg/m2) and arm span index (%) were calculated as follows (12); BMI: weight (kg)/height (m2), arm span index (%): arm span/height.

Warm-up

All subjects started the testing session with a 15-min warm-up which included 10 min of self-paced jogging around the handball field (similar to what players do prior to training sessions or matches) and 5 min. dynamic stretching exercises, which consisted of front kicks with hand reach, walking lunges, high knee skipping and butt kicks. Each exercise was performed twice on a 20-m line.

Ball velocity

Ball velocity was measured with a speed radar (SpeedTrac X Sport Radar-5200, Canada), which was placed in between the target and the subject (4). Both RS and RP were performed twice with 20-s rest interval. Higher score was registered (in km/h) and used in the statistical analyses (14).

Throw with both arms free to move (RP)

This throw is performed with the subject in a sitting position (with hips flexed around 90 degrees and abducted at about 20 degrees) with the non-throwing shoulder flexed. A target was set at 4.5 m away from the subject (dimensions 50 x 50 cm, 75 cm above the ground). Each subject performed two throws to the target with the non-throwing arm free to move, allowing upper body rotation (4).

Throw with non-throwing hand on the ground (RS)

This throw is also performed with the subject in the same sitting position (with hips flexed around 90 degrees and abducted at about 20 degrees). However, hand of the non-throwing arm is placed on the ground, limiting the range of motion for the upper body. Each subject performed two throws to the target.

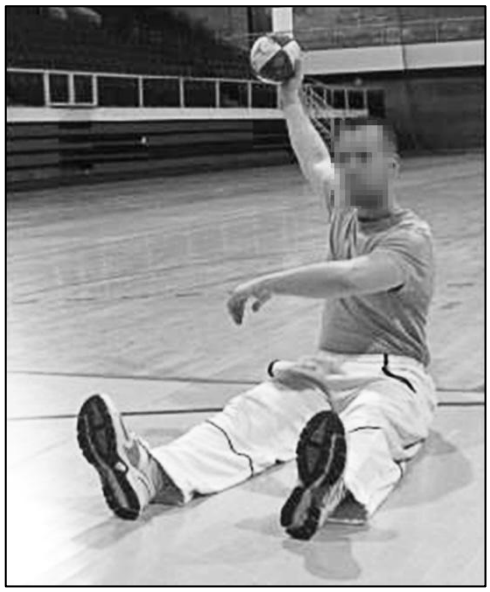

Figure 1. Throw with non-throwing hand free to move (RP)

Figure 2. Throw with hand of the non-throwing arm on the ground (RS)

Grip strength

Hand grip strength on the dominant side was measured using a hand grip dynamometer (Takei Scientific Instruments Co., Ltd., Japan). During the test, shoulder joint was at anatomical position (9). Subjects were instructed to squeeze the dynamometer maximally, to hold the contraction for 5 s. with no ancillary body movements (8). Two trials were separated by a 45-s rest interval, and the higher score was registered for the statistical analysis.

Statistical Analysis

Descriptive statistics were defined as minimum, maximum, mean and standard deviation. Normality was tested with skewness and kurtosis, and the Levene test was used for homogeneity. Data was found to be normally distributed (-1.5, +1.5 for skewness and kurtosis respectively). Independent variables in the hierarchical linear regression that were added in the first step were: body fat, trunk muscle mass, BMI and handgrip, whereas dependent variables were throw with the hand of non-throwing arm on the floor (RP), throw with non-throwing arm free to move (RS). Hand length, hand breadth, sitting height, arm span index were added as independent variables in the 2nd step of the model. Alpha value of 0.05 was accepted as statistically significant and SPSS®18.0 program was used to conduct the statistical analysis.

RESULTS

The descriptive data for ball velocity, handgrip strength and anthropometric characteristics of the players are presented in table 2. *Hierarchical multiple regression analysis results for anthropometric characteristics, handgrip strength and* ball velocity for RS is shown in Table 3 whereas *hierarchical multiple regression analysis results with anthropometric characteristics, handgrip strength and* RP are shown in table 4.

Table 2. The descriptive data for ball velocity, handgrip strength and anthropometric characteristics of the players

Variables	Minimum	Maximum	Mean	Std. Deviation
Ball velocity in RP (km/h)	26.00	53.00	42.83	8.94
Ball velocity in RS (km/h)	22.00	58.00	44.75	10.82
Body fat (%)	16.50	33.60	24.56	5.71
Trunk muscle mass (kg)	12.20	32.10	21.25	6.44
BMI (kg/m²)	19.30	31.40	23.80	3.55
Handgrip strength (kg)	21.20	38.70	32.58	5.09
Hand length (cm)	6.60	9.20	8.40	0.89
Hand breadth (cm)	7.70	9.10	8.24	0.40
Sitting height (cm)	84.90	94.70	89.10	3.03
Arm span index (%)	0.97	1.04	1.00	0.02

RS: throw with the hand of non-throwing arm on the floor, RP: throw with non-throwing arm free to move, BMI: Body Mass Index

Table 3. Hierarchical multiple regression analysis results for explaining anthropometric characteristics, handgrip strength and ball velocity from throw with RP

	β	t	p	R	R²	Adjusted R²	F	p
Model 1								
Body fat (%)	0.231	0.464	0.657	0.785	0.616	0.397	2.808	0.111
Trunk muscle mass (kg)	0.831	2.643	0.033					
BMI (kg/m²)	-0.613	-1.207	0.266					
Handgrip (kg)	0.221	0.764	0.470					
Model 2								
Body fat (%)	0.123	0.132	0.903	0.791	0.626	-0.370	0.629	0.734
Trunk muscle mass (kg)	1.248	0.644	0.565					
BMI (kg/m²)	-0.721	-0.586	0.599					
Handgrip strength (kg)	0.495	0.452	0.682					
Hand length (cm)	-0.286	-0.235	0.830					
Hand breadth (cm)	-0.091	-0.143	0.895					
Sitting height (cm)	-0.255	-0.182	0.867					
Arm span index (%)	-0.044	-0.074	0.946					

BMI: Body Mass Index

Body fat percent, trunk muscle mass, BMI and hand grip strength which were included in the first step of the model did not predict the RP performance and found to be insignificant ($p>0.05$). However, there was a positive correlation between trunk muscle mass and ball velocity ($r = 0.831$; $p<0.05$). Hand length, hand width, sitting height and arm length which were included in the 2nd step of the model were also insignificant and did not predict RP performance ($p>0.05$). No relationship was found between the variables of the 2nd model and RP performance ($p>0.05$). Performance was also not predicted even when all of the variables combined from Model 1 and Model 2 ($p>0.05$).

Table 4. Hierarchical multiple regression analysis results for explaining anthropometric characteristics, handgrip strength and ball velocity with RS

	β	t	p	R	R^2	Adjusted R^2	F	p
Model 1								
Body fat (%)	0.029	0.051	0.961	0.719	0.517	0.242	1.876	0.220
Trunk muscle mass (kg)	0.635	1.801	0.115					
BMI (kg/m²)	-0.583	-1.024	0.340					
Handgrip strength (kg)	0.368	1.132	0.295					
Model 2								
Body fat (%)	-0.114	-0.112	0.918	0.747	0.557	-0.623	0.472	0.824
Trunk muscle mass (kg)	0.562	0.267	0.807					
BMI (kg/m²)	-0.260	-0.194	0.858					
Handgrip strength (kg)	0.480	0.402	0.715					
Hand length (cm)	0.138	0.104	0.924					
Hand breadth (cm)	-0.301	-0.432	0.695					
Sitting height (cm)	-0.024	-0.015	0.989					
Arm span index (%)	-0.154	-0.237	0.828					

BMI: Body Mass Index

Body fat percent, trunk muscle mass, BMI and hand grip strength which were included in the first step of the model did not predict ball velocity with RS and found to be insignificant (p>0.05). Furthermore, no relationship was found between RS performance and variables of Model 1 (p>0.05). Hand length, hand width, sitting height and arm length which were included in the 2nd step of the model were also insignificant and did not predict the ball velocity for RS (p>0.05). No relationship was found between the variables of 2nd model and RS performance (p>0.05) and performance was also not predicted even when all of the variables combined from Model 1 and Model 2 (p>0.05).

DISCUSSION

This study aimed to investigate the relationship between anthropometrics of female handball players such as body fat (%), trunk muscle mass (kg), BMI, handgrip strength, hand length, hand breadth, sitting height, and arm span index and the ball velocity. *Original contribution of body fat percentage, trunk muscle mass, BMI and handgrip strength included in the model in the first step was not significant within the model and the ball velocity (both for RP and RS) was failed to be predicted. Additionally, it was determined that hand length,* hand breadth, *sitting height and* arm span index *included in the model in the second step were not significant in the model as well and did not predict the ball velocity (as performance measure for both RP and RS). However, there was a positive relationship between trunk muscle mass and ball velocity with RP. According to the results of this study, all of our hypotheses were refuted.*

These results are contrary to some of the studies in the literature. For instance, Zapartidis et al., reported that ball throwing velocity of young male handball players which was measured from the penalty throw position was significantly correlated with body height, body mass, arm span and hand length but not BMI (24). Skoufas et al., (16), also found similar results with the study of Zapartidis et al., and reported that throwing velocity of novice handball players is correlated with body mass, lean body mass, arm span, arm span index, hand width and breadth (with the fingers abducted) (16).

Shalfawi et al., highlighted the importance of strength and power for both upper and lower extremities in order to achieve high throwing velocity (15). In this regard, van den Tillaar & Ettema further reported that ball velocity from a standing throw position was affected by fat free mass (FFM) and maximal isometric strength in well trained male and female handball players (18). In our study, strength level of the players was measured by using a hand dynamometer. According to Andrade et al., hand dynamometry is a simple and reliable test for evaluating male handball players' strength, whereas it has been shown to have high correlation with the isokinetic strength of shoulder rotator muscles in female players (1). Visnapuu & Jürimäe (21), also argued that a good grasp has a positive influence on the ball speed. The main finding of our study was that there is a positive relationship between trunk muscle mass and ball velocity for the RS position. Based on this, we concluded that the results of our study are

partially similar with the study of Tillaar & Ettema (18).

However, it should also be noted that while increased FFM is correlated with greater strength and higher velocity for the ball with a throw (6,7,18), higher body fat percentage values show a negative correlation with throwing speed (11).

The difference between the findings in our study and those in the previous studies could be attributed to sex differences, age, anthropometric characteristics of the player, and playing experience (9,18,23,24). According to Foretić et al., throw with non-throwing arm free to move and non-throwing arm on the ground are valid and reliable positions to measure the ball velocity in sports such as handball, water polo, tennis, volleyball, basketball (4). In our study, we aimed to analyze the effects of various upper body anthropometric characteristics and handgrip strength on ball velocity with the throws done from either RP or RS in female handball players.

The rationale behind using standardized positions such as RS or RP was to minimize effects of anthropometrics and strength of other body parts on the ball velocity. When previous studies were examined, we noticed that majority of them used the penalty throw, 7-m standing throw and 9-m throw after three steps and a jump to measure ball velocity (13, 15, 18, 23, 24). Therefore, contradictory results between those and our study might be attributed to the differences in ball throwing technique of the subjects done from different positions.

It should also be noted that the most important limitation of the current study is the small sample size. A possible replication study with a larger sample size may lead to different results.

CONCLUSION

The results demonstrate that ball velocity in handball is independent from body fat (%), BMI, handgrip strength, hand length, hand breadth, sitting height and arm span index. Because there was a positive relationship found between trunk muscle mass and ball velocity from throwing with the hand of the non-throwing arm on the ground, we recommend to handball players and their coaches to consider designing resistance training programs that focus on improving trunk muscle mass to improve ball velocity for the over arm throws.

REFERENCES.

1. Andrade DS, Fachina RJ, Cruz W, Benedito-Silva AA, Da Silva AC, De Lira CA. Strength field tests performance are correlated with isokinetic strength of shoulder rotator muscles in female handball players. The Journal of Sports Medicine Physical Fitness, 2014; 54 (4): 403-409.
2. Bayios IA. Anastasopoulou EM, Sioudris DS, Boudolos KD. Relationship between isokinetic strength of the internal and external shoulder rotators and ball velocity in team handball. Journal of Sports Medicine and Physical Fitness, 2001; 41 (2): 229-235.
3. 3. Debanne T, Laffaye G. Predicting the throwing velocity of the ball in handball with anthropometric variables and isotonic tests. Journal of Sports Sciences, 2011; 29 (7): 705-713.
4. 4. Foretić N, Uljević O, & Prižmić A. Some metric characteristics of tests to assess ball speed during overarm throw performance. SportLogia, 2010; 6 (2):59-64.
5. 5. Ghobadi H, Rajabi H, Farzad B, Bayati M, Jeffreys I. Anthropometry of world-class elite handball players according to the playing position: reports from men's handball world championship 2013. Journal of Human Kinetics, 2013; 9: 213-220.
6. 6. Granados C, Izquierdo M, Ibanez J, Bonnabau H, Gorostiaga EM. Differences in physical fitness and throwing velocity among elite and amateur female handball players. International Journal of Sports Medicine, 2007; 28 (10): 860-867.
7. 7. Granados C, Izquierdo M, Ibanez J, Ruesta M, Gorostiaga EM. Effects of an entire season on physical fitness in elite female handball players. Medicine & Science in Sports & Exercise, 2008; 40(2): 351-361.
8. 8. Hammami M, Hermassi S, Gaamouri N, Aloui G, Comfort P, Shephard RJ, et al. Field tests of performance and their relationship to age and anthropometric parameters in adolescent handball players. Frontiers Physiol, 2019;10:1124.
9. 9. Lijewski M, Burdukiewicz A, Pietraszewska J, Stachoń A, Andrzejewska J, Chromik K. Anthropometric and strength profiles of professional handball players in relation to their playing position–multivariate analysis. Acta of Bioengineering and Biomechanics, 2019; 21(4):147-155.
10. 10. Milanese C, Piscitelli F, Lampis C, Zancanaro C. Anthropometry and body composition of female handball players according to competitive level or the playing position. Journal of Sports Sciences, 2011; 29 (12): 1301-1309.
11. 11. Moss SL, McWhannell N, Michalsik LB, Twist C. Anthropometric and physical performance characteristics of top-elite, elite and non-elite youth female team handball players. Journal of Sports Sciences, 2015; 33(17): 1780-1789.
12. 12. Nygaard HA. Measuring body mass index (BMI) in nursing home residents: the usefulness of measurement of arm span. Scandinavian Journal of Primary Health Care, 2008; 26(1), 46-49.
13. 13. Piscitelli F, Milanese C, Sandri M, Cavedon V, Zancanaro C. Investigating predictors of ball-throwing velocity in team handball: the role of sex, anthropometry, and body composition. Sport Sciences for Health, 2016; 12 (1): 11-20.
14. 14. Saavedra JM, Kristjánsdóttir H, Einarsson IÞ, Guðmundsdóttir ML, Þorgeirsson S, Stefansson A. Anthropometric characteristics, physical fitness, and throwing velocity in elite women's handball teams. The Journal of Strength & Conditioning Research, 2018; 32(8): 2294-2301.
15. 15. Shalfawi SA, Seiler S, Tønnessen E, Haugen TA. Shooting velocity aspects in Norwegian elite team handball. Serbian Journal of Sports Sciences, 2014; 8: 33-40.

16. 16. Skoufas D, Kotzamanidis C, Hatzikotoylas K, Bebetsos G, Patikas D. The relationship between the anthropometric variables and the throwing performance in handball. Journal of Human Movement Studies, 2003; 45(5): 469-484.
17. 17. Tabachnick BG, Fidell LS. Using multivariate statistics, 6th (ed.) Boston, MA.,2013
18. 18. van den Tillaar R, Ettema G. Effect of body size and gender in overarm throwing performance. European Journal of Applied Physiology, 2004; 91(4): 413-418.
19. 19. Vila H, Ferragut C. Throwing speed in team handball: a systematic review. International Journal of Performance Analysis in Sport, 2019;19(5): 724-736.
20. 20. Vila H, Ferragut C, Argudo FM, Abraldes JA, Rodríguez N, Alacid F. Relationship between anthropometric parameters and throwing velocity in water polo players. Journal of Human Sport and Exercise, 2009; 4 (I): 57-68.
21. 21. Visnapuu M, Jürimäe T. Handgrip strength and hand dimensions in young handball and basketball players. Journal of Strength and Conditioning Research, 2007; 21 (3): 923-9.
22. 22. Zapartidis I, Gouvali M, Bayios I, Boudolos K. Throwing effectiveness and rotational strength of the shoulder in team handball. Journal of Sports Medicine and Physical Fitness, 2007; 47 (2): 169-78.
23. 23. Zapartidis I, Skoufas D, Vareltzis I, Christodoulidis T, Toganidis T, Kororos P. Factors influencing ball throwing velocity in young female handball players. The Open Sports Medicine Journal, 2009; 3(1):39-43.
24. 24. Zapartidis I, Kororos P, Christodoulidis T, Skoufas D, Bayios I. Profile of young handball players by playing position and determinants of ball throwing velocity. Journal of Human Kinetics, 2011; 27, 17-30.

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Effect of Covid-19 Pandemic on Recreational Awareness and Quality of Life

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Abstract

The Covid-19 pandemic has significantly changed individuals' quality of life. Authorities have taken various measures to protect general public health. These measures, which are taken to fight the virus effectively during the pandemic, have also limited many recreational activities that individuals can do in daily life. In this study, the participants were university students, and the recreational awareness levels of the participants and the effects of the Covid-19 pandemic on the quality of life of the participants were discussed in terms of various variables (n=818). The SPSS package program was used in the analysis of the research data, and Kolmogorov Smirnov test and Shapiro tests were applied to determine the normality of the data distribution. Since the data did not have a normal distribution, that is, non-parametric distribution, besides descriptive statistical models, Mann Whitney U, Kruskal Wallis test, and correlation analysis were applied. A significant positive relationship was found between recreational awareness and the effect of the Covid-19 pandemic on quality of life. As a result, a significant difference was found between the recreational awareness levels of university students and their demographic variables only in the variable of being infected with the Covid-19, and no significant difference was found in other variables. As a result, it was understood that there were significant differences in the variable of being infected with Covid-19. It has been determined that there are significant differences between the effect of the Covid-19 pandemic on the quality of life and gender, age, welfare level and being infected with Covid-19. It has been observed that university students are adversely affected not only psychologically, but also both socially and professionally due to the pandemic.

Keywords: Pandemic, Covid-19, Quality of Life, Recreation, Recreational Awareness

Covid-19 Pandemisinin Rekreasyonel Farkındalık ve Yaşam Kalitesine Etkisi

Özet

Covid-19 pandemisi bireylerin yaşam kalitesini önemli ölçüde değiştirmiştir. Yönetimler, genel halk sağlığını koruyabilmek amacıyla çeşitli önlemler almıştır. Pandemi sürecinde virüsle etkin bir şekilde mücadele edebilmek amacıyla alınmış olan bu önlemler, bireylerin gündelik hayatta yapabileceği birçok rekreasyonel aktiviteyi de sınırlandırmıştır. Üniversite öğrencilerinin rekreasyonel farkındalık düzeyleri ile Covid-19 pandemisinin yaşam kalitesi üzerindeki etkilerinin çeşitli değişkenler açısından ele alındığı bu çalışmaya toplam 818 kişi katılım göstermiştir. Araştırma verilerinin analizinde SPSS paket programından yararlanılmış olup veri dağılımın normalliğini tespit etmek için Kolmogronov Smirnov testi ve Shapiro testleri uygulanmıştır. Verilerin normal bir dağılıma sahip olmadığı yani Non-parametrik olduğu için tanımlayıcı istatiksel modellerin yanı sıra Mann Whitney U, Kruskal Wallis testi ve korelasyon analizi uygulanmıştır. Rekreasyonel farkındalık ile Covid-19 pandemisinin yaşam kalitesine etkisi arasında pozitif yönde anlamlı bir ilişki tespit edilmiştir. Sonuç olarak üniversite öğrencilerinin rekreasyonel farkındalık düzeyleri ile demografik değişkenleri arasında yalnızca Covid-19 hastalığı geçirme durumu değişkeninde anlamlı farklılık tespit edilmiş bunun dışında diğer değişkenlerde herhangi anlamlı bir farklılık tespit edilmemiştir. Covid-19 pandemisinin yaşam kalitesine etkisi ile katılımcıların yaş, cinsiyet, refah durumu ve Covid-19 hastalığını geçirme durumu değişkenleri arasında anlamlı farklılıklar tespit edilmiştir. Sonuç olarak Covid-19 ile enfekte olma değişkeninde anlamlı farklılıklar olduğu anlaşıldı. Covid-19 pandemisinin yaşam kalitesine etkisi ile cinsiyet, yaş, refah düzeyi ve Covid-19 ile enfekte olma arasında anlamlı farklılıklar olduğu belirlendi. Üniversite öğrencilerinin pandemi nedeniyle sadece psikolojik olarak değil, sosyal ve mesleki açıdan da olumsuz etkilendiği gözlemlendi.

Anahtar Kelimeler: Pandemi, Covid-19, Yaşam Kalitesi, Rekreasyon, Rekreasyonel Farkındalık.

INTRODUCTION

The Covid-19 pandemic is known as one of the latest threats of respiratory diseases that directly affect global public health (1). Coronaviruses are also known as RNA viruses that infect humans and various animals. These viruses, which were first revealed in 1966, belong to four different families: alpha, beta, gamma, and delta coronavirus. Alpha and beta coronaviruses originate especially from mammals, while gamma and delta coronaviruses are transmitted from birds and pigs. Among these subspecies that can infect humans, beta coronaviruses cause serious illness and death, while alpha coronaviruses cause mild symptoms (2). The current coronavirus disease emerged in the city of Wuhan in China's Hubei Province in December 2019, and this virus caused acute atypical respiratory disease. The virus that caused these diseases was named Covid-19. The virus is effectively contagious and has spread around the world in a short time. As a result of the worldwide prevalence of the virus, it has been declared a global pandemic by the World Health Organization (WHO) (3). It has been stated that pneumonia, severe acute respiratory syndrome symptoms, and multi-organ failure have been found in people infected with Covid-19 and it exacerbates chronic diseases (4,5). Because of these reasons various restrictions have been implemented to prevent the pandemic and its effects. The restrictions have generally been implemented taking into consideration individuals' time and management of this time. As a result of the pandemic, the time management of individuals has also been affected while most people have had the chance to spend more time for leisure activities in the process. In addition to the increase in leisure, various restrictions have been implemented also for indoor activities and areas. Therefore, both the measures and the size and impact of the pandemic naturally and negatively have affected the daily lives of individuals, their time, and leisure management and in the simplest sense, there has been a decrease in physical activity while there has been an increase in inactive lifestyle (6,7,8).

Generally speaking, the pandemic has had impacts on the health, safety, and well-being of individuals and communities alike. These effects may translate into a range of emotional reactions (such as distress or psychiatric conditions), unhealthy behaviors (such as excessive substance use), and non-compliance with public health directives (such as home confinement and vaccination) in people who contract the disease and in the general population (9). In the most basic sense, individuals who meet their primary needs have difficulty in meeting their secondary needs as a result of restrictions. For example, being also a social being, the human being cannot fully meet the socialization needs outside of Psychological needs in this period. Participation in recreational activities, which refer to one of the most effective ways of socializing and meeting this need, cannot be ensured to the full. Recreational activities are socially accepted and shared by all groups and classes in society (10). Recreation meets the individual's need for self-actualization as well as socialization (11,12,13). Understanding the motivations of participation in recreational activities (14), attitudes (15), benefits obtained as a result of participation in activities (16,17,18,19) and the levels of satisfaction (20) will also create awareness not only on leisure but also on activities.

Recreational awareness is the state of being aware of what recreation means for the individual and what those individual gains as a result of participation in activities (21). Recreational awareness and consciousness can be important in terms of making use of leisure activities and participation in activities.

In consideration of the foregoing, this study aims to examine the effects of the pandemic on the quality of life of university students and their recreational awareness in terms of various variables.

MATERIAL AND METHOD

Method

Data Collection Tools

In addition to the "Personal Information Form" created by the researchers as a data collection tool in the study, the “Recreation Awareness Scale (RAS)” and “The Effect of the Pandemic on Quality of Life Scale (EPQLS)” were used.

The "Recreational Awareness Scale" developed by Ekinci and Özdilek was used as a data collection tool to measure the awareness of participation in recreational activities. The original scale consists of 41 items and 3 sub-dimensions (21). These sub-dimensions are Pleasure-Entertainment, Social-Success, and Self-improvement. The Pleasure-Entertainment sub-dimension includes items 1-10, the Social-Success sub-dimension items 11-28, and

the Self-improvement sub-dimension items 29-41. The items of the scale are ranged and rated on a 5-point Likert type as (1) "I strongly disagree", and (5) "I strongly agree". The total internal consistency score of the scale was found to be .882 for this study. In addition, The Impact of the Covid 19 Pandemic on Quality of Life, which was developed and validated specifically for the report of the International Scientific Association by Erçetin et al.(23), was used. The scale consists of 4 sub-dimensions including "psychological", "social", "professional" and "familial" effect and 29 items, 13 of which are in "psychological", 4 of which are in "social" and in "professional", and 8 of which are in "familial" effect. The scale is structured in a 4-point Likert-type scale as "I am barely affected, (2) I am slightly affected, (3) I am affected, and (4) I am highly affected". The reliability coefficient for this study was found to be .898.

Participants

The population of the study consists of individuals studying in various departments of universities. The participants to be included in the sampling were selected using the convenience sampling method and the sample group consists of a total of 818 university students (446 females (54.5%) and 372 males (45.5%)). Determined via the convenience sampling method, this sample is also called accidental or grab sampling. Convenience sampling involves taking a sample group of people easy to reach (22).

Statistical Analysis

In the analysis of the data obtained in the study, percentage and frequency were used to determine the distribution of personal information of the participants, and the values of the data were checked with the Kolmogorov Smirnov test and Shapiro test to determine whether the data showed a normal distribution. As a result of the analyses, it was determined that the data did not have a normal distribution, which indicates the data showed a "Non-Parametric" distribution. For this reason, Mann Whitney U, Kruskal Wallis test, and correlation analysis methods were used apart from descriptive statistical models in the statistical analysis of the data ($\alpha = 0.05$).

Ethical Text

In this article, journal writing rules, publication principles, research and publication ethics rules, journal ethics rules were followed. Responsibility for any violations that may arise regarding the article belongs to the authors. Before the research, the necessary permission was obtained from the Scientific Research and Publication Ethics Committee of Karamanoğlu Mehmetbey University (Date: 29.03.2021, No: 2021-19).

Findings

Along with the demographic information of the participants, the findings obtained as a result of this study are presented in tables with their explanations under this section.

Table 1. Distribution of Scale Scores

Sub-dimensions	Number of items	Mean	Sd	p
RAS 1 (Pleasure-Entertainment)	10	3.28	1.44	.000
RAS 2 (Social-Success)	18	3.30	1.39	.000
RAS 3 (Self-improvement)	13	3.32	1.42	.000
RAS (Total)	41	3.29	1.40	.000
EPQLS 1 (Psychological)	13	2.22	.854	.000
EPQLS 2 (Social)	4	2.37	.858	.000
EPQLS 3 (Professional)	4	2.29	.953	.000
EPQLS 4 (Familial)	8	2.53	.917	.000
EPQLS (Total)	29	2.33	.755	.000

In Table 1 includes the mean scores of the participants in the Recreational Awareness Scale (RFS) and the Effect of the COVID-19 Pandemic on Quality of Life Scale (EPQLS) sub-dimensions and the Kolmogorov Smirnov test and Shapiro test significance values, which were used to determine the structure of the data. Accordingly, it was determined that the highest average for the RFS was 3.32 in the "Self-improvement" sub-dimension and 2.53 in the "Familial effect" sub-dimension for the EPQLS. Considering the significance values (p), it was revealed that the data had a non-parametric structure.

Table 2. Demographic Information of Participants

Variables		**f**	**%**
Gender	Female	446	54,5
	Male	372	45,5
	Total	**818**	**100,0**
Age	17-20	371	45,4
	21-25	344	42,1
	26 and over	103	12,6
	Total	**818**	**100,0**
Grade	1st-grade	290	35,5
	2nd-grade	221	27,0
	3rd-grade	155	18,9
	4th-grade	152	18,6
	Total	**818**	**100,0**
Level of welfare	Low	195	23,8
	Moderate	498	60,9
	High	125	15,3
	Total	**818**	**100,0**
Sufficiency of leisure	Certainly insufficient	119	14,5
	Insufficient	156	19,1
	Normal	350	42,8
	Sufficient	124	15,2
	Certainly sufficient	69	8,4
	Total	**818**	**100,0**
Were you infected by the Covid-19?	Yes	148	18,1
	No	670	81,9
	Total	**818**	**100,0**
Were any friends or relatives of you infected with the Covid-19?	Yes	515	63,0
	No	303	37,0
	Total	**818**	**100,0**

As seen in Table 2, 54.5% of the participants were women, 45.4% were in the 17-20 age groups, 35.1% were 1st-grade students, 60.9% had a moderate level of welfare, 42.8% of them had normal free time, 81.9% were not infected with the COVID-19, and 63% had friends or relatives in their inner circle who were infected with the COVID-19.

Table 3. Distribution of Participants' Recreational Awareness and Quality of Life Scores of the COVID-19 Pandemic by Gender

Sub-dimensions	**Variables**	**Mean Rank**	**Mean**	**Z**	**p**
RAS 1 (Pleasure-Entertainment)	Female	400,01	3,2838	-1,09	,275
	Male	382,39			
RAS 2 (Social-Success)	Female	397,73	3,3073	-,984	,325
	Male	381,84			
RAS 3 (Self-improvement)	Female	396,48	3,3286	-,880	,379
	Male	382,30			
RAS (Total)	Female	399,31	3,2999	-,922	,357
	Male	384,36			
EPQLS 1 (Psychological Effect)	Female	415,60	2,2202	-3,62	**,000**
	Male	357,05			
EPQLS 2 (Social Effect)	Female	396,37	2,3740	-1,41	,157
	Male	373,72			
EPQLS 3 (Professional Effect)	Female	410,63	2,2984	-3,37	**,001**
	Male	356,69			
EPQLS 4 (Familial Effect)	Female	385,23	2,5310	-,106	,916
	Male	386,92			
EPQLS (Total)	Female	408,12	2,3372	-2,53	**,011**
	Male	367,20			

According to the Mann-Whitney U test results in Table 3, it was determined that there was no significant difference between the genders of the participants and their Recreational Awareness levels in all sub-dimensions and total scores, but there was a significant difference according to the psychological effect and professional effect and the total score of the scale. ($p<0.05$).

Table 4. Distribution of Participants' Recreational Awareness and Quality of Life Scores According to the Variable of Being Infected with the COVID 19

Sub-dimensions	Variables	Mean Rank	Mean	Z	p
RAS 1 (Pleasure-Entertainment)	Yes	323,89	3,2838	-3,97	,000
	No	406,96			
RAS 2 (Social-Success)	Yes	326,44	3,3073	-3,74	,000
	No	404,63			
RAS 3 (Self-improvement)	Yes	325,93	3,3286	-3,73	,000
	No	404,04			
RAS (Total)	Yes	326,68	3,2999	-3,81	,000
	No	406,93			
EPQLS 1 (Psychological Effect)	Yes	439,74	2,2202	-2,97	,003
	No	377,75			
EPQLS 2 (Social Effect)	Yes	401,27	2,3740	-,905	,365
	No	382,58			
EPQLS 3 (Professional Effect)	Yes	411,69	2,2984	-1,52	,127
	No	380,25			
EPQLS 4 (Familial Effect)	Yes	346,95	2,5310	-2,31	,021
	No	394,74			
EPQLS (Total)	Yes	411,42	2,3372	-1,28	,200
	No	384,65			

According to the Mann-Whitney U test results in Table 4, there was a significant difference in all sub-dimensions and total scores between the variables of being infected with the COVID 19 s and the levels of Recreational Awareness of the participants. On the other hand, it was determined that there was a significant difference according to the scores of the sub-dimensions of Psychological effect and Familial Effect ($p<0.05$).

Table 5. Distribution of Participants' Recreational Awareness and Quality of Life Scores of by Age

Sub-dimensions	Variables	Mean Rank	Mean	X2	p
RAS 1 (Pleasure-Entertainment)	17-20	392,78	3,2838	2,31	, 314
	21-25	400,37			
	26 and over	361,41			
RAS 2 (Social-Success)	17-20	385,65	3,3073	4,68	,096
	21-25	406,85			
	26 and over	353,11			
RAS 3 (Self-improvement)	17-20	388,42	3,3286	5,13	,077
	21-25	404,67			
	26 and over	346,95			
RAS (Total)	17-20	388,93	3,2999	3,86	,145
	21-25	406,86			
	26 and over	357,22			
EPQLS 1 (Psychological Effect)	17-20	416,05	2,2202	10,74	,005
	21-25	374,68			
	26 and over	342,09			
EPQLS 2 (Social Effect)	17-20	408,76	2,3740	9,67	,008
	21-25	378,32			
	26 and over	332,98			
EPQLS 3 (Professional Effect)	17-20	415,79	2,2984	12,86	,002
	21-25	369,36			
	26 and over	337,63			
EPQLS 4 (Familial Effect)	17-20	387,96	2,5310	14,10	,001
	21-25	406,56			
	26 and over	311,10			
EPQLS (Total)	17-20	412,52	2,3372	12,89	,002
	21-25	385,72			
	26 and over	321,21			

According to the Kruskal-Wallis test in Table 5, it was determined that there was no significant difference between the ages of the participants and their Recreational Awareness levels in all sub-dimensions and total scores, but there was a significant difference in all sub-dimensions and total score of the EPQLS ($p<0.05$).

Table 6. Distribution of Participants' Recreational Awareness and Quality of Life Scores of by Level of Welfare

Sub-dimensions	Variables	Mean Rank	Mean	X2	P
RAS 1 (Pleasure-Entertainment)	Low	389,97	3,2838	2,04	,360
	Moderate	399,29			
	High	366,80			
RAS 2 (Social-Success)	Low	384,04	3,3073	2,42	,298
	Moderate	399,50			
	High	365,39			
RAS 3 (Self-improvement)	Low	377,47	3,3286	3,79	,150
	Moderate	402,06			
	High	362,41			
RAS (Total)	Low	383,99	3,2999	2,78	,248
	Moderate	402,49			
	High	366,65			
EPQLS 1 (Psychological Effect)	Low	480,62	2,2202	40,91	.000
	Moderate	359,55			
	High	362,61			
EPQLS 2 (Social Effect)	Low	462,39	2,3740	29,59	,000
	Moderate	366,30			
	High	344,99			
EPQLS 3 (Professional Effect)	Low	479,84	2,2984	42,99	,000
	Moderate	357,43			
	High	355,31			
EPQLS 4 (Familial Effect)	Low	408,32	2,5310	17,37	,000
	Moderate	396,82			
	High	308,39			
EPQLS (Total)	Low	470,51	2,3372	34,25	,000
	Moderate	371,32			
	High	335,13			

According to the Kruskal-Wallis test in Table 6, it was determined that there was no significant difference in all sub-dimensions and total scores between the level of welfare of the participants and their Recreational Awareness levels, but there was a significant difference in all sub-dimensions and the total score of the EPQLS. ($p<0.05$).

Table 7. Results of Correlation Analysis of Recreational Awareness and Quality of Life Scales

		RAS 1	RAS 2	RAS 3	RAS T	EPQLS 1	EPQLS 2	EPQLS 3	EPQLS 4	EPQLS T
RAS 1	R	1,000								
	p	.								
	N	783								
RAS 2	R	,955**	1,000							
	p	,000	.							
	N	780	780							
RAS 3	R	,946**	,977**	1,000						
	p	,000	,000	.						
	N	778	778	779						
RAS T	R	,974**	,993**	,987**	1,000					
	p	,000	,000	,000	.					
	N	783	780	779	784					
EPQLS 1	R	,199**	,179**	,184**	,183**	1,000				
	p	,000	,000	,000	,000					
	N	767	765	763	767	777				
EPQLS 2	R	,302**	,283**	,284**	,286**	,757**	1,000			
	p	,000	,000	,000	,000	,000				
	N	763	763	761	763	771	771			
EPQLS 3	R	,198**	,184**	,190**	,186**	,813**	,768**	1,000		
	p	,000	,000	,000	,000	,000	,000			
	N	763	763	762	764	770	769	771		
EPQLS 4	R	,382**	,383**	,384**	,385**	,472**	,565**	,424**	1,000	
	p	,000	,000	,000	,000	,000	,000	,000	.	
	N	763	763	762	764	770	769	771	771	
EPQLS T	R	,314**	,299**	,304**	,303**	,921**	,860**	,844**	,733**	1,000
	p	,000	,000	,000	,000	,000	,000	,000	,000	.
	N	767	765	764	768	777	771	771	771	778

P=0.01

As a result of the correlation analysis, it was determined that there was a positive relationship between Recreational Awareness and the Quality of Life Scores.

DISCUSSION AND CONCLUSION

In this study, which was designed to examine the effect of Covid-19 on quality of life of university students and their recreational awareness in terms of various demographic factors during the pandemic, no significant difference was found between the genders of the participants and their recreational awareness levels, while the effect of the Covid-19 pandemic on quality of life significantly differentiated in terms of "Psychological Effect" and "Professional Effect". Female participants were more affected sychologically and professionally than male participants. In the study conducted by Üstün and Aktaş Üstün (24), no significant relationship was found between the gender variable and recreational awareness levels. In a study conducted by Browning et al. (25) on university students to determine the psychological effects of the Covid-19, it was determined that female participants were psychologically affected by the Covid-19 more than male participants. According to the study conducted by Kalaylıoğlu (26), the professional negative effects of the pandemic are felt more in women than in men. It is suggested that this is not only due to gender but also due to traumas experienced by individuals both during the pandemic and in previous periods, negative living conditions, and the stress they are exposed to during the pandemic.

It was revealed that the variable of being infected with the Covid-19 and the level of

recreational awareness differentiated in all sub-dimensions and that individuals who were not infected had higher recreational awareness. It is suggested that this may be due to the fact that individuals infected with the Covid-19 are less in number than individuals who were not infected. In addition, significant differences were found between the "psychological effect" and "Familial Effect" sub-dimensions and the variable of being infected with the Covid-19. Individuals infected with the Covid-19 were affected psychologically more than individuals who were not infected with the Covid-19 and the "Familial Effect" sub-dimension was higher in individuals who were not infected with the Covid-19. This may arise from fear, anxiety, uncertainty, confusion, and symptoms or side effects of the disease experienced by individuals who were infected. One may also notice that that as a result of the support of individuals from their families during both the infection and the treatment process and that the family solidarity brought about increased commitment within the family. In a study conducted by Ergül and Yılmaz (27), it was determined that the Covid-19 pandemic increased family interaction. In the study conducted by Moradi et al. (28) on individuals infected with the Covid-19, it was determined that patients were psychologically affected by this process.

While no significant difference was found between age and recreational awareness levels, a significant difference was found in all sub-dimensions of the Effect of the Covid-19 on Quality of Life. Yılmaz (29) reported that recreational awareness levels do not show any difference in terms of age. Çar et al. (30) attempted to determine physiotherapist candidates' awareness in sports, concluding that the level of awareness did not differ significantly in terms of age. Kılıçman (31) reported differences between all sub-dimensions of recreational awareness and age. This result is not in line with the findings of this study. In addition, it was determined that individuals between the ages of 17 and 20 were affected more psychologically, socially, and professionally than individuals in other age groups during the pandemic process. It was also revealed that individuals between the ages of 21-24 show an increase in family relationships compared to other age groups. In the first days of the pandemic and in the following processes, some restrictions were implemented to keep the pandemic under control and to protect public health. Some of these restrictions were the lockdown for those aged 20 and under with some exceptions then for his age group to go out between certain hours, and closure of some socialization spaces for young due to the pandemic This may arise from the de-socialization of individuals aged 20 and under as a result of restrictions, causing psychological effects, and from business-related factors. Chaturvedi et al. (32) examined the impact of the Covid-19 on students' education, social life, and psychology, concluding that the pandemic affected students' mental health, education, and daily routine activities. Apart from this, there are various studies finding that young people and students were negatively affected by the Covid-19 (33,34).

There was no significant difference between the level of welfare of the participants and their recreational awareness levels. The participants with moderate levels of income had higher recreational awareness levels than the other participants. This may arise from the higher number of individuals with moderate income in the sample group. Uyar (35) reported that the level of awareness in sport differed significantly according to the income level and that the awareness levels of individuals with high-income levels were higher. According to a study conducted by Piercy et al. (36), it was determined that the level of physical activity awareness increased as the income level of the participants increased. According to a study conducted by Corder et al. (37) who examined parental awareness of physical activities in children, it was determined that individuals with high-income levels have more awareness of physical activity than other income groups. Ergül et al. (27) reported that the awareness levels of the students increased as their income increased. It was also determined that the Effect of the Covid-19 on Quality of Life of the welfare level variable differentiated in all sub-dimensions.

It was determined that individuals with low-income levels were adversely affected by the pandemic psychologically, socially, and professionally compared to individuals with other income levels. Family relationships of low-income individuals developed positively compared to individuals in other income groups. The Covid-19 pandemic has weakened the economic power of both individuals and countries in general. For example, according to a study conducted by Bayar et al. (38), the pandemic has negatively affected income distribution. It was also revealed that the decreases in income levels differed according to the income

groups and that the individuals in the high-income group experience less income loss proportionally, but the income loss was higher in the low-income individuals. The main factors could be the economic difficulties of low-income individuals during the pandemic, the limited opportunities compared to other income groups, and the decrease in job opportunities. It can be said that the Familial Effect may have increased the solidarity of the individuals struggling with these and similar problems during the pandemic with their family members. Pieh et al. (39) examined the effect of the Covid-19 pandemic on depression and anxiety, concluding that the pandemic had an effect on stress and various psychological problems in low-income individuals. According to a study conducted by Shevlin et al. (40), it was revealed that individuals with low-income showed more depression and anxiety symptoms during the pandemic compared to other income groups. According to a study conducted by Rodríguez et al. (41), the perceived stress level during the pandemic was worse for individuals with low income and as the income level increases, the stress level decreases and stress management is easier.

A positive and significant relationship was found between recreational awareness and the effect of the Covid-19 on quality of life. According to a study conducted by Kasapoğlu (42), it was determined that the Covid-19 fear had a significant relationship with the sub-dimensions of transcendence, harmony with nature, and anomie, which are sub-dimensions of mental well-being. According to another study conducted by Duman (43), it was revealed that there was a significant relationship between the Covid-19 fear and the levels of intolerance of uncertainty. According to a study conducted by Kement and Demirci (44), it was determined that there was a significant relationship between environmentally friendly recreational behaviour and ecological awareness.

As a result, the recreational awareness level of the participants showed no significant difference in terms of gender, age, and level of welfare variables while a significant difference was found only in the variable of being infected with the Covid-19. There were significant differences between the effect of the Covid-19 pandemic on quality of life and gender, age, level of welfare, and being infected with the Covid-19. It should be emphasised and taken into consideration that university students are negatively affected by the pandemic in psychological, social, and professional terms. Therefore, measures to be taken should be providing various pieces of training to ensure the psychological recovery of individuals, making educational interventions both socially and individually to increase the empathy levels and awareness levels of groups at risk, facilitating individual psychological counselling processes, creating guiding seminars and online courses that can contribute to the development of university students in a professional sense. It is also recommended that this study be carried out on wider sample groups and revised by choosing comparative and mixed methods.

REFERENCES

1. Guan, W., Ni, Z., Hu, Y., Liang, W., Ou, C., He, J., … Zhong, N. Clinical Characteristics of Coronavirus Disease 2019 in China. New England Journal of Medicine, 2020; 382(18), 1708–1720. doi:10.1056/nejmoa2002032
2. Velavan, T. P. ve Meyer, C. G. The COVID-19 epidemic. Tropical Medicine and International Health. 2020; Blackwell Publishing Ltd. doi:10.1111/tmi.13383
3. Yuki, K., Fujiogi, M. ve Koutsogiannaki, S. COVID-19 pathophysiology: A review. Clinical Immunology. 2020; Academic Press Inc. doi:10.1016/j.clim.2020.108427
4. Cao, X. COVID-19: Immunopathology and its implications for therapy. Nature Reviews Immunology. Nature Research. 2020; 20 (5), 269-270. doi:10.1038/s41577-020-0308-3
5. Yang, L., Liu, S., Liu, J., Zhang, Z., Wan, X., Huang, B., … Zhang, Y. COVID-19: immunopathogenesis and Immunotherapeutics. Signal Transduction and Targeted Therapy. 2020; Springer Nature. doi:10.1038/s41392-020-00243-2
6. Landry, C. E., Bergstrom, J., Salazar, J. ve Turner, D. How Has the COVID-19 Pandemic Affected Outdoor Recreation in the U.S.? A Revealed Preference Approach. Applied Economic Perspectives and Policy, 2020; 0(0), 1–15. doi:10.1002/aepp.13119
7. Rice, W. L., Mateer, T. J., Reigner, N., Newman, P., Lawhon, B. ve Taff, B. D. Changes in recreational behaviors of outdoor enthusiasts during the COVID-19 pandemic: analysis across urban and rural communities. Journal of Urban Ecology, 2020; 6(1), 1–7. doi:10.1093/jue/juaa020
8. Yeo, T. J. Sport and exercise during and beyond the COVID-19 pandemic. European Journal of Preventive Cardiology. 2020; SAGE Publications Inc. doi:10.1177/2047487320933260
9. Pfefferbaum, B. ve North, C. S. Mental Health and the Covid-19 Pandemic. New England Journal of Medicine, 2020; 383(6), 510–512. doi:10.1056/nejmp2008017
10. Gulam, A. Recreation-Need and importance in modern society. International Journal of Physiology, Nutrition and Physical Education, 2016; 1(2), 157–160. www.journalofsports.com adresinden erişildi.
11. Aksu, H. S. Rekreasyon ve ihtiyaç kavramı. Içinde İ. Kayantaş M. Söyler (Ed.), Sporda Akademik Yaklaşımlar-6 2020; (ss. 71–85). Ankara: Gece Kitaplığı.
12. Gray, S. W. The relationship between self-actualization and leisure satisfaction. Psychology: A Journal of Human Behavior, 1986; 23(1), 6–12. https://psycnet.apa.org/record/1987-13136-001
13. Vogler, J. W.. Self-actualization and peak experiences in outdoor recreation. ProQuest LLC. 2012; https://tigerprints.clemson.edu/all_theses adresinden erişildi.

14. Çuhadar, A., Er, Y., Demirel, M. ve Demirel, D. H. Bireyleri rekreasyonel amaçli egzersize motive eden faktörlerin incelenmesi. Spormetre Beden Eğitimi ve Spor Bilimleri Dergisi, 2019; 17(3), 153-161.
15. Tükel, Y. Sportif rekreasyon faaliyeti olarak masa tenisi oynayan sporcuların spora yönelik tutumlarının cinsiyete ve medeni duruma göre değerlendirilmesi . Sportive , 2018; 1 (1) , 12-18 . Retrieved from https://dergipark.org.tr/tr/pub/sportive/issue/40676/495437
16. Andre, E. K., Williams, N., Schwartz, F. ve Bullard, C. Benefits of Campus Outdoor Recreation Programs: A Review of the Literature. Journal of Outdoor Recreation, Education, and Leadership, 2017; 9(1), 15–25. doi:10.18666/jorel-2017-v9-i1-7491.
17. Brymer, E., Crabtree, J. ve King, R. Exploring perceptions of how nature recreation benefits mental wellbeing: a qualitative enquiry. Annals of Leisure Research, 2020; 1–20. doi:10.1080/11745398.2020.1778494
18. Lackey, N. Q., Tysor, D. A., McNay, G. D., Joyner, L., Baker, K. H. ve Hodge, C. Mental health benefits of nature-based recreation: a systematic review. 2019; Annals of Leisure Research. doi:10.1080/11745398.2019.1655459
19. Thomsen, J. M., Powell, R. B. ve Monz, C. A Systematic Review of the Physical and Mental Health Benefits of Wildland Recreation. Journal of Park and Recreation Administration, 2018; 36(1), 123–148. doi:10.18666/jpra-2018-v36-i1-8095
20. Serdar, E., Demirel, M., Harmandar Demirel, D., ve Donuk, B.. Öğrencilerinin serbest zaman doyum düzeyleri ile mutluluk düzeyleri arasındaki ilişki. Sosyal Bilimler Dergisi, 2018; (5), (28) 429-438.
21. Ekinci, N. E. ve Özdilek, Ç. Investigation of University Students' Awareness of Recreational Activities. International Online Journal of Educational Sciences, 2019; 11(2), 53–66. doi:10.15345/iojes.2019.02.004
22. Özen, Y. ve Gül, A. Sosyal ve Eğitim bilimleri Araştirmalarinda Evren-Örneklem Sorunu. Atatürk Üniversitesi Kazım Karabekir Eğitim Fakültesi Dergisi, 2007; (15), 394-422.
23. Erçetin, Ş.,Ş., Potaş, N., Açıkalın, N., Ş., Çevik, S., M. COVID-19 Pandemisi'nin Yaşam Kalitesine Etkisi Ölçeği (COVID-19 YKEÖ). Uluslararası Bilim Derneği, COVID 19 Pandemisinin Yaşam Kalitesine Etkisi: 2020; 30 Mart-5 Nisan 2020 (İstanbul, Ankara, Konya) Raporu.
24. Üstün, Ü. D. ve Aktaş Üstün, N. Üniversite Öğrencilerinin Rekreasyonel Etkinliklerin Faydaları Hakkındaki Farkındalıklarının İncelenmesi. Spor ve Eğitim Bilimleri Dergisi, 2020; 7(7-S1), 38–48. doi:10.33468/sbsebd.128
25. Browning, M. H. E. M., Larson, L. R., Sharaievska, I., Rigolon, A., McAnirlin, O., Mullenbach, L., … Alvarez, H. O. Psychological impacts from COVID-19 among university students: Risk factors across seven states in the United States. PloS one, 2021; 16(1), e0245327. doi:10.1371/journal.pone.0245327
26. Kalaylıoğlu, Y. Türkiye'de COVID-19 Etkilerinin Toplumsal Cinsiyet Açısından Değerlendirilmesi. UN Women,2020; İsveç Uluslararası Kalkınma İşbirliği Ajansı (SIDA). Rapor Özeti.
27. Ergül, B. ve Yılmaz, V. COVID-19 Salgını Süresince Aile İçi İlişkilerin Doğrulayıcı Faktör Analizi ile İncelenmesi. IBAD Sosyal Bilimler Dergisi, Özel Sayı, 2020; 38–51. doi:10.21733/ibad.733909
28. Moradi, Y., Mollazadeh, F., Karimi, P., Hosseingholipour, K. ve Baghaei, R. Psychological disturbances of survivors throughout COVID-19 crisis: a qualitative study. BMC Psychiatry, 2020; 20(1), 594. doi:10.1186/s12888-020-03009-w
29. Yılmaz, U. C. Ortaokul Yöneticilerinin Rekreasyon Farkındalık Algı Düzeylerinin İncelenmesi (Batman İl Örneği) (Yayınlanmamış Yüksek Lisans Tezi). 2020; T.C. Batman Üniversitesi. Sosyal Bilimleri Enstitüsü, Rekreasyon Yönetimi Anabilim Dalı, Batman.
30. Çar, B., Yarayan, Y. E., İlhan, E. L. ve Güzel, N. A. Zihinsel Yetersizliği Olan Bireylerde Sporun Etkilerine Yönelik Farkındalık: Fizyoterapist Adaylarına Yönelik Bir Araştırma. Beden Eğitimi ve Spor Bilimleri Dergisi, 2019; 3(3), 267–273. https://dergipark.org.tr/tr/pub/bsd/664692 adresinden erişildi.
31. Kılıçman, İ. Rekreasyon Farkındalığı ve Sosyal Medya Bağımlılığının Yaşam Doyumu Üzerine Etkilerinin İncelenmesi: Üniversite Öğrencileri Üzerine Bir Araştırma (Yayınlanmış Yüksek Lisans Tezi). 2020; T.C. Karamanoğlu Mehmetbey Üniversitesi, Sosyal Bilimler Enstitüsü, Rekreasyon Yönetimi Anabilim Dalı, Karaman.
32. Chaturvedi, K., Vishwakarma, D. K. ve Singh, N. COVID-19 and its impact on education, social life and mental health of students: A survey. Children and Youth Services Review, 2021; 121, 105866. doi:10.1016/j.childyouth.2020.105866
33. Abdullah, M. F. I. L. Bin, Murad, N. S., Teoh, S. H. ve Mohamad, M. A. Quality of Life of University Students During The COVID-19 Pandemic : Age, History of Medical Illness, Religious Coping, COVID-19 Related Stressors, Psychological Factors and Social Support Were Predictive of Quality of Life. Research Square, 2020; 1–33. doi:10.21203/rs.3.rs-104496/v1
34. Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J. ve Zheng, J. The psychological impact of the COVID-19 epidemic on college students in China. Psychiatry Research, 2020; 287, 112934. doi:10.1016/j.psychres.2020.112934
35. Uyar, Y. Spor farkindaliği ölçeğinin geliştirilmesi ve toplumun spor farkindaliklarinin değerlendirilmesi. (Yayınlanmamış Doktora Tezi). 2019; T.C. Ankara Üniversitesi Sağlık Bilimleri Enstitüsü. Spor Bilimleri Anabilim Dalı, Ankara.
36. Piercy, K. L., Bevington, F., Vaux-Bjerke, A., Hilfiker, S. W., Arayasirikul, S. ve Barnett, E. Y. Understanding contemplators' knowledge and awareness of the physical activity guidelines. Journal of Physical Activity and Health, 2020; 17(4), 404–411. doi:10.1123/jpah.2019-0393
37. Corder, K., Crespo, N. C., van Sluijs, E. M. F., Lopez, N. V. ve Elder, J. P. Parent awareness of young children's physical activity. Preventive Medicine, 2012; 55(3), 201–205. doi:10.1016/j.ypmed.2012.06.021
38. Bayar, A. A., Günçavdı, Ö. ve Levent, H. Covıd-19 Salgınının Türkiye'de Gelir Dağılımına Etkisi ve Mevcut Politika Seçenekleri. 2020; İstanbul, İnsani ve Toplumsal Kalkınma Programı Toplumsal Adalet ve Eşitsizlikler, İstanbul Politik Araştırmalar Enstitüsü, Politika Raporu.
39. Pieh, C., Budimir, S. ve Probst, T. The effect of age, gender, income, work, and physical activity on mental health during coronavirus disease (COVID-19) lockdown in Austria. Journal of Psychosomatic Research, 2020; 136. doi:10.1016/j.jpsychores.2020.110186
40. Shevlin, M., McBride, O., Murphy, J., Miller, J. G., Hartman, T. K., Levita, L., … Bentall, R. P. Anxiety, depression, traumatic stress and COVID-19-related anxiety in the UK general population during the COVID-19 pandemic. BJPsych Open, 2020; 6(e125), 1–9. doi:10.1192/bjo.2020.109
41. Rodríguez, S., Valle, A., Piñeiro, I., Rodríguez-Llorente, C., Guerrero, E. ve Martins, L. Sociodemographic Characteristics and Stress of People from Spain Confined by COVID-19. European Journal of Investigation in Health, Psychology and Education, 2020; 10(4), 1095–1105. doi:10.3390/ejihpe10040077

42. Kasapoğlu, F. Examining the Relationship between Fear of COVID-19 and Spiritual Well-Being. Spiritual Psychology and Counseling, 2020; 5(3), 341–354. doi:10.37898/spc.2020.5.3.121
43. Duman, N. Üniversite Öğrencilerinde COVID-19 Korkusu ve Belirsizliğe Tahammülsüzlük. The Journal of Social Science, 2020; 4(8), 426–437. doi:10.30520/tjsosci.748404
44. Kement, Ü. ve Demirci, B. Ekolojik Farkındalığın Çevre Dostu Rekreasyon Davranışına Etkisi: Turizm Eğitimi Alan Öğrenciler Üzerine Bir Araştırma. Seyahat ve Otel İşletmeciliği Dergisi, 2017; 14(3), 135–148. doi:10.24010/soid.369930

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Comparison of the Dynamic Balance in Youth Male Wrestlers According to Age, Body Mass Index, and Participation Level

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Abstract

The aim of this study was to evaluate the dynamic balance in youth wrestlers according to age, body mass index (BMI), and participation level. A total of 68 youth male wrestlers participated in this study. They were subdivided according to participation levels (elite and sub-elite), age (13-14,15-16,17-18) and BMI (<20, 20-25, >25). The modified star excursion balance test (mSEBT) was performed by the same sports medicine specialist. All directional scores (anterior (A), posterior-lateral (PL), posterior-medial (PM)) and composite score (CS) on the dominant ($p<0.01$; $p<0.01$; $p<0.01$; $p<0.01$; respectively) and non-dominant sides ($p<0.01$; $p<0.03$; $p<0.01$; $p<0.01$; respectively) were higher in elite-level wrestlers compared to sub-elite ones. According to age, the dominant side's A, PM scores and CS in 17-18 year-old wrestlers were higher compared to younger ones ($p<0.01$; $p=0.01$; $p<0.01$; respectively) and the non-dominant side's all scores (A, PL, PM, CS) in 17-18 year-old wrestlers were higher compared to younger ones ($p<0.01$; $p<0.01$; $p<0.01$; $p<0.01$; respectively). According to BMI, the dominant side's A, PL scores, and CS in wrestlers with a BMI<20 were significantly lower compared to BMI>20 ($p=0.01$; $p=0.02$; $p=0.01$; respectively). Dynamic balance in youth wrestlers may differ by age, BMI and level of participation. Balance measurements in youth athletes should be performed periodically and necessary precautions should be taken to fix the balance impairments.

Keywords: Balance, Youth athlete, Sports medicine, Age, Wrestler

Genç Erkek Güreşçilerde Dinamik Dengenin Yaş, Beden Kitle İndeksi ve Katılım Düzeyine Göre Karşılaştırılması

Özet

Bu çalışmanın amacı, genç güreşçilerin dinamik denge profilini yaş, vücut kitle indeksin (VKİ) ve katılım düzeyine göre değerlendirmektir. Çalışmaya toplam 68 genç erkek güreşçi katıldı. Güreşçiler katılım düzeyleri (elit ve sub elit), yaş (13-14, 15-16, 17-18) ve VKI (<20, 20-25,> 25) olarak alt gruplara ayrıldı. Tüm katılımcılara modifiye edilmiş yıldız denge testi (mSEBT) aynı spor hekimliği uzmanı tarafından uygulandı. Tüm yön skorları (ön (Ö), arka-dış (AD), arka-iç (AÇ)) ve toplam skor (TS) dominant ($p<0.01$; $p<0.01$; $p<0.01$; $p<0.01$; sırasıyla) ve dominant olmayan tarafta ($p<0.01$; $p<0.01$; $p<0.01$; $p<0.01$; sırasıyla) elit seviye güreşçilerde sub elitlere göre anlamlı olarak yüksekti. Güreşçiler yaşa göre değerlendirildiğinde, 17-18 yaş güreşçilerde dominant tarafın Ö, Aİ ve TS skorları, 13-14 ve 15-16 yaş güreşçilere göre anlamlı olarak yüksekti ($p<0.01$; $p=0.01$; $p<0.01$; sırasıyla) ve dominant olmayan tarafın tüm skorları (Ö, AD, Aİ, TS) 17-18 yaş güreşçilerde 13-14 ve 15-16 yaş güreşçilere göre anlamlı olarak yüksekti ($p<0.01$; $p<0.01$; $p<0.01$; $p<0.01$; sırasıyla). VKİ'ne göre değerlendirildiğinde, VKİ<20 olan güreşçilerde dominant tarafın Ö, AD skorları ve TS, VKİ>20'den büyük olan güreşçilere göre anlamlı olarak daha düşüktü ($p=0.01$; $p=0.02$; $p=0.01$; sırasıyla). Dinamik denge genç güreşçilerde yaş, VKİ ve katılım düzeyine göre değişiklik gösterebilir. Genç güreşçilerde denge ölçümleri düzenli aralıklarla yapılmalı, denge bozukluklarının giderilmesi için gerekli önlemler alınmalıdır.

Anahtar kelimeler: Denge, Genç sporcu, Spor hekimliği, Yaş, Güreş

INTRODUCTION

Wrestling is a popular sport in Turkey (35). Beside its historical importance, the fact that wrestling is characterized by high-intense, fast-paced movements, it even increases popularity (32). In addition, due to the nature of the sport, some specific drills such as takedown, sparring etc. are also required (34).

The high-intensity nature of the game combined with the frequent opponent contact places wrestlers at an increased risk of injury (34). Thus, high injury incidence in adult wrestlers (annual average, 4.04 injuries) is noticeable (46). Also, in youth wrestling, the injury incidence is 6.0 and 9.6 injuries per 1,000 athletic-exposures (spent time during matches or trainings) (30, 34). In addition to this, when the injury characteristics are evaluated in youth wrestlers, it can be seen that the most frequently injured areas are the knees and shoulders and the most common injury type are sprain, strain (34). These injuries are not only common but also often serious (34). Since these injuries cause a high injury burden (injury incidenceXinjury severity), it is advised that the physicians should focus to prevent the injury rather than the treat (3).

In order to prevent sports injuries, firstly, the extent of the injury problem should be established. The etiology and mechanism of the injury should be investigated. Then, evidence-based protective measures should be developed (58). It is also necessary to identify the risk factors to prevent the sports injury (6, 12). In this context, it has already been known that poor balance is a risk factor for lower extremity injuries (16, 33). Therefore, balance measurements in athletes should be made to identify balance impairments. These impairments (if any) should be fixed in order to reduce sports injuries (12, 18).

On the other hand, balance does not only have a positive effect to prevent sports injuries, but also affects athletic performance directly (especially in sports branches which sudden perturbations, changes of direction, etc. are frequent; such as wrestling) (19, 33, 52). Moreover, it can improve some athletic parameters (such as: plyometric, coordination, etc.) by increasing proprioceptive acuity (22, 27). In addition to these, balance and physical fitness may be affected by age and level of participation in sports (21, 27). Therefore, evaluating balance can play an important role in youth wrestling in both preventing sports injuries and improving athletic performance (28).

As mentioned above, although balance is very important for youth wrestlers, to our knowledge, there is not enough study evaluating the dynamic balance in elite and sub-elite level youth wrestlers. The aim of the present study is to evaluate the dynamic balance in elite and sub-elite youth wrestlers. It was hypothesized that the elite-level wrestlers and older ages would have better balance.

MATERIAL AND METHOD

Participants

This study was conducted in accordance with the Helsinki declaration, and approved by Sutcu Imam University Clinical Research Ethical Committee (2019-120/1). After the youth athletes and their families were informed of all the experimental procedures to be undertaken, 71 well-trained youth male wrestlers in Turkey Olympic Preparation Center (TOPC) (elite level) and Wrestling Training Center (WTC) (sub-elite level) squad participated in this study voluntarily (written informed consent). All participants in each group have the same team training schedule for 8-9 practices per week. Also, the diet regimens of the participants were the same. Exclusion criteria: 1) history of surgery or severe injury in the lower extremity, 2) chronic neuromuscular and/or musculoskeletal disease, 3) acute injuries in the lower extremity.

Study Design

At the beginning of the study, all participants were evaluated by the same sports medicine specialist. Three participants were excluded from the study (meniscus surgery history, knee joint laxity, and acute ankle sprain). Then height, weight, and leg length of 68 participants were measured. Also, participants were asked which side was dominant by asking the kicking leg. They were subdivided according to participation levels (elite and sub-elite), age (13-14, 15-16, 17-18) and BMI (<20, 20-25, >25). Since it is known that there is a negative effect of fatigue on balance, balance measurements were performed after 2 days of rest (56). The study was completed with 68 participants. Confidentiality of all participant data was ensured.

Measurements

Height, weight and leg length, BMI

On the morning of the modified Star excursion balance test (mSEBT) day, before breakfast, the weights of wrestlers were measured with an electronic scale device (Omron HN-286). Then the heights of wrestlers were measured with a tape measure. Each leg length was measured from the anterior superior iliac spine to the ipsilateral medial malleolus while wrestlers were lying on supine position. All measurements were performed by the same sports medicine specialist.

Balance test

The mSEBT is a screening tool used to measure dynamic balance and it has been shown to have good interrater and intrarater reliability (51, 54). The mSEBT consists of three 2 meters lines taped on floor (anterior (A), posterior-lateral (PL), and posterior-medial (PM)) joining at an angle of 120 degrees at the midpoint. First, all athletes were shown how to perform the mSEBT. Before the test, the participants were warmed up for 8-10 minutes. Then, participants had 4 practice reaches in each direction for familiarization. The test was performed on barefoot. The stance legs of participants were placed at the center of the "Y" with the most distal end of the big toe stays on the mark zero. Participants were asked to reach as far as possible to tap the floor with one foot. The reach distance was noted for each participant by the distal part of the big toe in each direction while hands remained on hips for valid trials. If the participant removed their hands from hips, did not return to the starting position, moved stance foot position, and transferred their bodyweight to the reaching foot to increase distance, the trial was accepted as invalid and the participant repeated the trial. Three valid tests were performed for each participant on both legs (dominant and non-dominant sides). Visual cues, such as objects on the floor and people not involved in the study, were removed from the testing area to avoid visual and auditory influences. No encouragement or further instruction was given to the participants throughout testing. All tests were performed by the same sports medicine specialist and the results were recorded by the same assistant. Directional scores for each direction were calculated according to the formula DS= (S1+S2+S3)/3/LLX100, where DS means direction score, S means score, LL means leg length. Also, the composite score for each leg was calculated according to formula CS= (Am+PLm+PMm)/3/LLX100, where CS means composite score, A means anterior, PL means posterior-lateral, PM means posterior-medial, and m means mean.

Statistical Analysis

SPSS 25.0 statistical package program was used to evaluate the data and find the calculated values. Data was summarized by giving means and standard deviations. Whether the data showed normal distribution or not was checked with Kurtosis-Skewness coefficient intervals, and it was determined that the data were normally distributed, as the range did not exceed the values of +2.0 and -2.0 (23). Since the data showed normal distribution, independent group t test was used for pairwise set comparisons, and One-Way Analysis of Variance (ANOVA) was used for comparisons of more than two sets. The level of significance was taken as 0.05.

RESULTS

The characteristics of participants were given in Table 1.

Table 1: Characteristics of participants (n=68)

	TOPC (n=34)	*WTC (n=34)*
Age	16.26±0.82	13.50±1.39
Height	169.88±6.78	158.08±12.23
Weight	69.11±13.82	50.44±15.65
LL	85.94±6.48	82.00±7.16
BMI	23.78±3.37	19.74±3.38
Years in sport	6.47±1.81	2.88±1.12

TOPC= Turkey Olympic Preparation Center; LL= leg length
WTC= Wrestling Training Center; BMI= Body Mass Index

There were significant differences in each directional score between the elite and sub-elite groups. All directional scores (A, PL, PM) on the dominant ($p<0.01$; $p<0.01$; $p<0.01$; respectively) and non-dominant sides ($p<0.01$; $p<0.01$; $p<0.01$; respectively) were higher in elite-level wrestlers compared to sub-elite ones. There were also significant differences in the dominant ($p<0.01$) and non-dominant sides composite scores ($p<0.01$) in favor of elite-level wrestlers (Table 2).

Table 2: Differences in balance between groups according to the level of participation (n=68)

		Mean	*Std*	*t*	*p*	*%95 CI*	
						Lower	*Upper*
D-A	TOPC	96.74	5.35	3.80	**<0.01****	2.51	8.05
	WTC	91.46	6.07				
D-PL	TOPC	110.55	7.03	3.14	**<0.01****	2.00	8.99
	WTC	105.05	7.38				
D-PM	TOPC	104.57	6.37	2.21	**<0.01***	0.40	7.84
	WTC	100.44	8.78				
D-CS	TOPC	104.03	5.03	3.50	**<0.01***	2.17	7.93
	WTC	98.98	6.72				
ND-A	TOPC	98.06	5.80	3.97	**<0.01****	3.02	9.13
	WTC	91.97	6.77				
ND-PL	TOPC	111.09	6.93	3.12	**<0.01***	2.10	9.55
	WTC	105.26	8.38				
ND-PM	TOPC	106.01	7.21	3.01	**<0.01***	1.98	9.78
	WTC	100.12	8.81				
ND-CS	TOPC	105.05	5.47	3.77	**<0.001****	2.79	9.07
	WTC	99.12	7.35				

Std= Standart deviation; D= dominant; ND= Non-dominant; A= Anterior, PL= Posteriolateral, PM= Posteriomedial; CS= Composite score; TOPC= Turkey Olympic Preparation Center; WTC= Wrestling Training Center; CI= Confidence interval; *p<0.01; **p<0.001

According to age, all directional scores (except dominant-PM) and both composite scores of 17-18 year-old wrestlers were significantly higher compared to scores of 13-14 year-old wrestlers (p<0.05). Additionally, dominant-A, non-dominant-A, PL and composite scores of 17-18 year-old wrestlers were significantly higher compared to scores of 15-16 year-old wrestlers (p<0.05) (Table 3).

Table 3: Differences in balance according to age

	Age	*Mean*	*Std*	*f*	*p*	*Post-hoc*
D-A	1	92.12	6.24	6.53	<0.01*	**1-2<3**
	2	93.37	4.81			
	3	98.78	6.74			
D-PL	1	105.17	7.86	4.91	0.01*	**1<3**
	2	107.57	7.01			
	3	112.59	6.63			
D-PM	1	101.02	9.37	1.23	0.29	-
	2	102.47	6.57			
	3	105.05	7.30			
D-CS	1	99.43	7.13	5.02	<0.01*	**1<3**
	2	101.14	5.03			
	3	105.66	5.88			
ND-A	1	92.58	6.71	7.72	<0.01*	**1-2<3**
	2	94.22	6.11			
	3	100.55	6.21			
ND-PL	1	105.46	7.88	6.49	<0.01*	**1-2<3**
	2	107.37	8.08			
	3	114.20	5.85			
ND-PM	1	100.01	9.21	5.36	<0.01*	**1<3**
	2	102.84	7.33			
	3	108.57	7.02			
ND-CS	1	99.35	7.35	8.25	<0.01*	**1-2<3**
	2	101.48	6.05			
	3	107.77	5.36			

Std= Standart deviation; D= dominant; ND= Non-dominant; A= Anterior; PL= Posteriolateral; PM= Posteriomedial; CS= Composite score; 1= 13-14; 2= 15-16; 3= 17-18 *p<0.01

According to BMI, the dominant side's anterior, posterior-lateral, and composite scores in those with a BMI<20 were significantly lower compared to BMI>20 (p=0.01; p=0.02; p=0.01; respectively). In addition, the non-dominant side's directional scores and composite scores in those with BMI<20 were lower, despite not statistically significant (p>0.05) (Table 4).

Table 4: Differences in balance according to BMI (n=68)

	BMI	*Mean*	*Std*	*f*	*p*	*Post-hoc*
D-A	1	91.35	6.13	4.98	**0.01***	**1<2**
	2	96.34	5.19			
	3	95.17	6.74			
D-PL	1	104.96	651	3.99	**0.02***	**1<3**
	2	108.66	8.23			
	3	111.41	7.15			
D-PM	1	99.98	8.65	2.39	0.09	-
	2	104.03	7.19			
	3	104.40	6.80			
D-CS	1	98.76	6.25	4.62	**0.01***	**1<2-3**
	2	103.01	5.92			
	3	103.84	6.11			
ND-A	1	92.72	7.00	2.78	0.06	-
	2	97.07	6.22			
	3	95.59	7.34			
ND-PL	1	105.71	7.21	2.93	0.06	-
	2	108.61	8.63			
	3	111.85	7.99			
ND-PM	1	100.32	7.45	2.54	0.08	-
	2	104.37	8.71			
	3	105.73	9.16			
ND-CS	1	99.58	6.33	3.05	0.05	-
	2	103.35	7.27			
	3	104.39	7.13			

BMI= Body mass index; Std= Standart deviation; D= dominant; ND= Non-dominant; A= Anterior; PL= Posteriolateral; PM= Posteriomedial; CS= Composite score; 1= BMI<20; 2= 20<BMI<25; 3= 25<BMI; *p<0.01

DISCUSSION

The main results of the present study were that i) elite-level youth wrestlers had better dynamic balance than sub-elite levels; ii) older youth wrestlers (17-18 years) had better dynamic balance than younger ones (13-14); and iii) wrestlers with higher BMI had better dominant side balance than lower BMI ones.

Dynamic balance is an important component in executing complex sport skills (15). In combat sports, especially in wrestling, it is important to use unstable dynamic situations to turn them to their advantage using the stimulation of muscular, articular, and cutaneous mechanoreceptors to adapt to the constant modifications of posture, ground and opponent contact (49, 50). Thus in recent studies, it has been reported that there are some physiological and neuromuscular differences between elite and amateur wrestlers (21, 40). Considering that elite-level wrestlers had better balance in all directions both legs compared to sub-elite ones in our study, it can be said that superior balance in elite-level wrestlers is a result of repetitive training experiences that influence motor responses and vestibular system (5). The superior balance may have also provided through higher training experiences that influence the athlete's ability to attend to relevant proprioceptive and visual cues (1, 44). Also, the results of our study suggested that higher-level wrestlers may possess a greater sensitivity of sensory receptors or better integration of information than lower-level ones (53). On the other hand, it is known that there is a relationship between dynamic balance and lower extremity injuries. Researchers reported that athletes with poor dynamic balance were 2-4 times more likely to the lower extremity injury compared to athletes with

better dynamic balance (11, 25, 41, 52, 55, 60). When considering that poor balance is a modifiable risk factor for sports injury, balance measurements of youth athletes should be performed and necessary precautions (if any) should be taken to reduce sports injuries (4, 13, 16). Lastly, for athletic performance, during a match, a wrestler with relatively low balance performance may consume more energy to maintain high athletic performance (21). Therefore, the fatigue may occur quickly due to the great amount of anaerobic energy expenditure generated, and this can cause impairment in performance (42).

It is known that postural control and balance may differ by age in healthy children (26, 59). The age dependency of dynamic balance is also valid for youth athletes. Thus, researchers reported that dynamic balance performance in youth athletes was lower than older and more mature ones (7, 8, 43, 45). Moreover, Steindl et al. stated that dynamic balance increases with age in childhood; until the visual and vestibular afferent systems reach to adult levels at 15 to 16 years of age (57). According to the results in our study supporting the literature, it can be said that the main reason why almost all dynamic balance directional scores of 17-18-year-old wrestlers were better than 13-14-year-old wrestlers was the difference in maturation. While the visual component of proprioception becomes more important in the anterior direction, vestibular and mechanoreceptive components are more important in posterior-medial, posterior-lateral directions, and composite score (38). When considering that these basic components that affect dynamic balance performance continue their development throughout adolescence, 17-18-year-old wrestlers had better balance than younger ones is an expected result (14, 45). Another important reason for balance differences according to wrestlers' age is years of experience in the sport. Because, training experiences that improve neuromuscular coordination, strength, etc. also improve the balance indirectly (9, 36, 48). Additionally, proprioceptive acuity may have directly improved with training experience by learning to pay attention to biomechanical cues (eg, joint position sense) in longer adaptation time (20, 31). In our study, the fact that 17-18-year-old wrestlers had more years of experience in the sport than younger counterparts may have positively affected their dynamic balance performance. In order to create good adult athletes, the most important thing is to ensure the complete and harmonic development of motor abilities from early ages and in accordance with youth athlete's body development (53). In the light of this information, the balance measurement in youth athletes should be performed periodically and necessary precautions should be taken to improve balance.

Although there is a relationship between muscle strength and balance in adults, the relationship between BMI and balance is little-known in childhood and adolescence (29, 37, 61). Moreover, the relationship between balance and injury in youth athletes is not clear in the literature. On the other hand, while some researchers reported that athletes who were lighter or had lower BMI were more likely to be injured compared to their heavier counterparts, others reported an increased rate of injury among heavier athletes with high BMI (2, 10, 24). Especially in older boys who tend to have higher BMI, the risk for injury may be higher due to they are faster, heavier, and stronger and they can easily generate greater forces that can cause injury to joints and tendons (17). In our study, since most athletes with a higher BMI are also elite level and older, it may not be very appropriate to evaluate the balance according to BMI alone. Nonetheless, the better dynamic balance was only on the dominant side in wrestlers with high BMI, because it was known that they often prefer the dominant side in specific drills such as takedown (47). It would not be wrong to say that athletes with higher BMI have better physical development and more muscle mass, and therefore their dynamic balance is better than those with lower BMI.

The present study has some limitations. We did not evaluate some athletic parameters affecting balance such as strength, plyometric, and coordination. Since dynamic balance may differ by gender and requirements of nature of sports, our results can not be generalized in both genders and all sports branches. The balance profiles of female wrestlers, and athletes participating in different sports should be assessed. Lastly, we did not measure the maturity level of youth athletes, despite the same chronological age may vary considerably in the biological maturity status and this can have substantial effects in executing complex sport skills in adolescent athletes (8, 39).

CONCLUSION

Dynamic balance in youth male wrestlers may differ by age, BMI and level of participation. Balance

measurements in youth athletes should be performed periodically and necessary precautions should be taken to fix the balance impairments.

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REFERENCES.

1. Ashton-Miller JA, Wojtys EM, Huston LJ, Fry-Welch D. 2001. Can proprioception really be improved by exercises? Knee surgery, sports traumatology, arthroscopy 9: 128
2. Backous DD, Friedl KE, Smith NJ, Parr TJ, Carpine WD. 1988. Soccer injuries and their relation to physical maturity. American Journal of Diseases of Children 142: 839-42
3. Bahr R, Clarsen B, Ekstrand J. 2018. Why we should focus on the burden of injuries and illnesses, not just their incidence. BMJ Publishing Group Ltd and British Association of Sport and Exercise Medicine
4. Bahr R, Holme I. 2003. Risk factors for sports injuries—a methodological approach. British journal of sports medicine 37: 384-92
5. Balter SG, Stokroos RJ, Akkermans E, Kingma H. 2004. Habituation to galvanic vestibular stimulation for analysis of postural control abilities in gymnasts. Neuroscience letters 366: 71-5
6. Bittencourt NF, Meeuwisse W, Mendonça L, Nettel-Aguirre A, Ocarino J, Fonseca S. 2016. Complex systems approach for sports injuries: moving from risk factor identification to injury pattern recognition—narrative review and new concept. British journal of sports medicine 50: 1309-14
7. Borah D, Wadhwa S, Singh U, Yadav SL, Bhattacharjee M, et al. 2007. Age related changes in postural stability. Indian J Physiol Pharmacol 51: 395-404
8. Breen EO, Howell DR, Stracciolini A, Dawkins C, Meehan III WP. 2016. Examination of age-related differences on clinical tests of postural stability. Sports health 8: 244-9
9. Bressel E, Yonker JC, Kras J, Heath EM. 2007. Comparison of static and dynamic balance in female collegiate soccer, basketball, and gymnastics athletes. Journal of athletic training 42: 42
10. Brust JD, Leonard BJ, Pheley A, Roberts WO. 1992. Children's ice hockey injuries. American journal of diseases of children 146: 741-7
11. Butler RJ, Lehr ME, Fink ML, Kiesel KB, Plisky PJ. 2013. Dynamic balance performance and noncontact lower extremity injury in college football players: an initial study. Sports health 5: 417-22
12. Caine D, DiFiori J, Maffulli N. 2006. Physeal injuries in children's and youth sports: reasons for concern? British journal of sports medicine 40: 749-60
13. Caine D, Maffulli N, Caine C. 2008. Epidemiology of injury in child and adolescent sports: injury rates, risk factors, and prevention. Clinics in sports medicine 27: 19-50
14. Committee PAGA. 2008. Physical activity guidelines advisory committee report, 2008. Washington, DC: US Department of Health and Human Services 2008: A1-H14
15. Davlin CD. 2004. Dynamic balance in high level athletes. Perceptual and motor skills 98: 1171-6
16. Emery CA. 2003. Risk factors for injury in child and adolescent sport: a systematic review of the literature. Clinical journal of sport medicine 13: 256-68
17. Emery CA. 2005. Injury prevention and future research. Epidemiology of Pediatric Sports Injuries 48: 179-200
18. Emery CA, Cassidy JD, Klassen TP, Rosychuk RJ, Rowe BH. 2005. Effectiveness of a home-based balance-training program in reducing sports-related injuries among healthy adolescents: a cluster randomized controlled trial. Cmaj 172: 749-54
19. Fort-Vanmeerhaeghe A, Romero-Rodriguez D, Lloyd RS, Kushner A, Myer GD. 2016. Integrative neuromuscular training in youth athletes. Part II: Strategies to prevent injuries and improve performance. Strength and Conditioning Journal 38: 9-27
20. Fry-Welch DK. 1998. Improvement in proprioceptive acuity with training
21. García-Pallarés J, López-Gullón JM, Muriel X, Díaz A, Izquierdo M. 2011. Physical fitness factors to predict male Olympic wrestling performance. European journal of applied physiology 111: 1747-58
22. Gebel A, Prieske O, Behm DG, Granacher U. 2020. Effects of balance training on physical fitness in youth and young athletes: a narrative review. Strength & Conditioning Journal 42: 35-44
23. George D. 2011. SPSS for windows step by step: A simple study guide and reference, 17.0 update, 10/e: Pearson Education India
24. Gómez JE, Ross SK, Calmbach WL, Kimmel RB, Schmidt DR, Dhanda R. 1998. Body fatness and increased injury rates in high school football linemen. Clinical journal of sport medicine: official journal of the Canadian Academy of Sport Medicine 8: 115-20
25. Gonell AC, Romero JAP, Soler LM. 2015. Relationship between the Y balance test scores and soft tissue injury incidence in a soccer team. International journal of sports physical therapy 10: 955
26. Gouleme N, Ezane MD, Wiener-Vacher S, Bucci MP. 2014. Spatial and temporal postural analysis: a developmental study in healthy children. International Journal of Developmental Neuroscience 38: 169-77
27. Hammami R, Chaouachi A, Makhlouf I, Granacher U, Behm DG. 2016. Associations between balance and muscle strength, power performance in male youth athletes of different maturity status. Pediatric Exercise Science 28: 521-34
28. Hanlon C, Krzak JJ, Prodoehl J, Hall KD. 2020. Effect of injury prevention programs on lower extremity performance in youth athletes: a systematic review. Sports health 12: 12-22
29. Hartley EM, Hoch MC, Boling MC. 2018. Y-balance test performance and BMI are associated with ankle sprain injury in collegiate male athletes. Journal of science and medicine in sport 21: 676-80
30. Hewett TE, Pasque C, Heyl R, Wroble R. 2005. Wrestling injuries. Epidemiology of Pediatric Sports Injuries 48: 152-78
31. Hirabayashi S-i, Iwasaki Y. 1995. Developmental perspective of sensory organization on postural control. Brain and development 17: 111-3
32. Horswill CA. 1992. Applied physiology of amateur wrestling. Sports Medicine 14: 114-43
33. Hrysomallis C. 2007. Relationship between balance ability, training and sports injury risk. Sports medicine 37: 547-56
34. Jarrett GJ, Orwin JF, Dick RW. 1998. Injuries in collegiate wrestling. The American journal of sports medicine 26: 674-80

35. Krawietz B. 2012. The sportification and heritagisation of traditional Turkish oil wrestling. The International Journal of the History of Sport 29: 2145-61
36. Lephart S, Giraldo J, Borsa P, Fu F. 1996. Knee joint proprioception: a comparison between female intercollegiate gymnasts and controls. Knee surgery, sports traumatology, arthroscopy 4: 121-4
37. Lopes VP, Stodden DF, Bianchi MM, Maia JA, Rodrigues LP. 2012. Correlation between BMI and motor coordination in children. Journal of Science and Medicine in Sport 15: 38-43
38. Ludwig O, Kelm J, Hammes A, Schmitt E, Fröhlich M. 2020. Neuromuscular performance of balance and posture control in childhood and adolescence. Heliyon 6: e04541
39. Malina RM, Bouchard C, Bar-Or O. 2004. Growth, maturation, and physical activity: Human kinetics
40. Maria Lopez-Gullon J, Muriel X, Dolores Torres-Bonete M, Izquierdo M, Garcia-Pallares J. 2011. Physical fitness differences between Freestyle and Greco-Roman elite wrestlers. Archives of Budo 7: 217-25
41. McGuine TA, Greene JJ, Best T, Leverson G. 2000. Balance as a predictor of ankle injuries in high school basketball players. Clinical Journal of Sport Medicine 10: 239-44
42. Morán-Navarro R, Valverde-Conesa A, López-Gullón JM, la Cruz-Sánchez D, Pallarés JG. 2015. Can balance skills predict Olympic wrestling performance? Journal of Sport & Health Research 7
43. Ozinga SJ, Linder SM, Koop MM, Dey T, Figler R, et al. 2018. Normative performance on the Balance Error Scoring System by youth, high school, and collegiate athletes. Journal of athletic training 53: 636-45
44. Paillard T, Costes-Salon C, Lafont C, Dupui P. 2002. Are there differences in postural regulation according to the level of competition in judoists? British journal of sports medicine 36: 304-5
45. Paniccia M, Wilson KE, Hunt A, Keightley M, Zabjek K, et al. 2018. Postural stability in healthy child and youth athletes: the effect of age, sex, and concussion-related factors on performance. Sports health 10: 175-82
46. Park KJ, Lee JH, Kim HC. 2019. Injuries in male and female elite Korean wrestling athletes: a 10-year epidemiological study. British journal of sports medicine 53: 430-5
47. Pasque CB, Hewett TE. 2000. A prospective study of high school wrestling injuries. The American journal of sports medicine 28: 509-15
48. Paterno MV, Myer GD, Ford KR, Hewett TE. 2004. Neuromuscular training improves single-limb stability in young female athletes. Journal of Orthopaedic & Sports Physical Therapy 34: 305-16
49. Perrin P, Deviterne D, Hugel F, Perrot C. 2002. Judo, better than dance, develops sensorimotor adaptabilities involved in balance control. Gait & posture 15: 187-94
50. Perrot C, Moes R, Deviterne D, Perrin P. 1998. Postural adaptations during specific combative sport movements. Science & Sports 2: 64-74
51. Plisky PJ, Gorman PP, Butler RJ, Kiesel KB, Underwood FB, Elkins B. 2009. The reliability of an instrumented device for measuring components of the star excursion balance test. North American journal of sports physical therapy: NAJSPT 4: 92
52. Plisky PJ, Rauh MJ, Kaminski TW, Underwood FB. 2006. Star Excursion Balance Test as a predictor of lower extremity injury in high school basketball players. Journal of orthopaedic & sports physical therapy 36: 911-9
53. Ricotti L. 2011. Static and dynamic balance in young athletes. Journal of human sport and exercise 6: 616-28
54. Shaffer SW, Teyhen DS, Lorenson CL, Warren RL, Koreerat CM, et al. 2013. Y-balance test: a reliability study involving multiple raters. Military medicine 178: 1264-70
55. Smith CA, Chimera NJ, Warren M. 2015. Association of y balance test reach asymmetry and injury in division I athletes. Medicine and science in sports and exercise 47: 136-41
56. Springer BK, Pincivero DM. 2009. The effects of localized muscle and whole-body fatigue on single-leg balance between healthy men and women. Gait & posture 30: 50-4
57. Steindl R, Kunz K, Schrott-Fischer A, Scholtz A. 2006. Effect of age and sex on maturation of sensory systems and balance control. Developmental Medicine & Child Neurology 48: 477-82
58. Van Mechelen W, Hlobil H, Kemper HC. 1992. Incidence, severity, aetiology and prevention of sports injuries. Sports medicine 14: 82-99
59. Verbecque E, Vereeck L, Hallemans A. 2016. Postural sway in children: A literature review. Gait & posture 49: 402-10
60. Wang H-K, Chen C-H, Shiang T-Y, Jan M-H, Lin K-H. 2006. Risk-factor analysis of high school basketball–player ankle injuries: A prospective controlled cohort study evaluating postural sway, ankle strength, and flexibility. Archives of physical medicine and rehabilitation 87: 821-5
61. Wang H, Ji Z, Jiang G, Liu W, Jiao X. 2016. Correlation among proprioception, muscle strength, and balance. Journal of physical therapy science 28: 3468-72

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Investigation Of Agility Performance In Some Anthropometric Variables For Young Male Soccer Players

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Abstract

The purpose of this study was to investigate the agility performance of young male soccer players in anthropometric variables. One hundred sixty-nine healthy young male soccer players (10, 11, 12, 13 and 14 age) were examined. The mean (SD) age was 12.31 ± 1.29 years, height was 153.28 ± 9.79 cm, body weight was 44.18 ± 10.30 kg, and Body Mass Index (BMI) was 18.57 ± 2.82 kg/m2 for the 169 young soccer players. Height, body mass index, body weight, 5-0-5 agility test, the pro-agility test, T test and Illinois agility test score were collected in 169 young soccer players. Body weight was significant predictor of pro-agility, 5-0-5 agility test, T test, and Illinois agility test while age was significant predictor of pro-agility, T test, and Illinois agility test. Also, height was significant predictor of 5-0-5 agility test, T test, and Illinois agility test. On the other hand, body mass index was significant predictor of T test and Illinois agility test. Players who higher body weight has performed better in all agility tests in this study. In conclusion, after 12 years of age, a small difference in maturation may imply a substantial difference in body height and weight, associated with a huge difference in agility performance.

Keywords: Agility; agility test; body mass index; body weight; height.

Genç Erkek Futbolcularda Çeviklik Performansının Bazı Antropometrik Değişkenler Açısından İncelenmesi

Özet

Bu çalışmanın amacı, genç erkek futbolcularda çeviklik performansının antropometrik değişkenler açısından incelenmesidir. Yüz altmış dokuz sağlıklı genç erkek futbolcu (10, 11, 12, 13 ve 14 yaş) araştırmaya katılmıştır. 169 genç erkek futbolcunun yaş ortalamaları 12.31±1.29 yıl, boy uzunluğu ortalamaları 153.28±9.79 cm, vücut ağırlığı ortalamaları 44.18±10.30 kg ve vücut kütle indeksi (VKİ) 18.57± 2.82 kg/m2 dir. Boy, vücut kütle indeksi, vücut ağırlığı, 5-0-5 çeviklik testi, Pro-agility testi, T testi ve Illinois çeviklik testi dereceleri 169 genç futbolcudan toplanmıştır. Vücut ağırlığı; çeviklik, 5-0-5 çeviklik testi, T testi ve Illinois çeviklik testleri için anlamlı bir gösterge iken, yaş parametresi de çeviklik, T testi ve Illinois çeviklik testinin anlamlı bir göstergesidir. Ayrıca boy parametresi 5-0-5 çeviklik testi, T testi ve Illinois çeviklik testi için önemli bir göstergedir. Bunun yanı sıra, vücut kütle indeksi ise T testi ve Illinois çeviklik testinin önemli bir belirleyicisidir. Vücut ağırlığı daha fazla olan futbolcular, bu çalışmada tüm çeviklik testlerinde daha iyi performans göstermiştir. Sonuç olarak, 12 yaşından sonra olgunlaşmadaki küçük bir fark, çeviklik performansında büyük bir gelişime sebep olarak boy ve vücut ağırlığında önemli bir değişime yol açmaktadır.

Anahtar Kelimeler: Boy uzunluğu, çeviklik; çeviklik testi, vücut ağırlığı, vücut kütle indeksi.

INTRODUCTION

Agility does not have a global definition, but it is often recognized as the ability to change direction and start and stop quickly. Agility is the ability to maintain and control correct body positions while quickly changing direction through a series of movement (5). Agility is believed to be an important physical component necessary for successful performance in many sports, particularly in soccer. Agility has a special importance in soccer, because of a great number of a typical game situations that demand multiple rapid change of direction in the relatively small-side of the game. Especially at elite level, playing soccer requires a range of technical and tactical skills as well as physical performance characteristics such as highly developed speed and agility (20). A soccer player who is agile is able to change direction abruptly without losing balance. Agility includes factors such as speed, strength, balance and coordination and is beneficial because it helps a player's ability to get and hold onto the ball (24). Performance in playing soccer requires not only technical, tactical, and psychological skills, but also depends on anthropometry and physical fitness (power of jumping, agility with and without the ball, and speed of cyclic or acyclic movements). Indeed, anthropometric characteristics of an athlete are important predictors of whether the athlete will reach the top level of their chosen sport. In soccer, weight, height and body sizes are significant contributors to better performance. In addition, soccer players with better abilities in speed, strength, and agility have advantages in game situations. Agility performance in soccer has been evaluated with different agility tests. However, the comparison of the athletes with his physical characteristics was made rather than associated. Whereas, the change in soccer players' physical characteristics such as height, body weight and body mass index is very important to explain the agility performance in terms of physical performance. Previous studies have estimated the relative contributions of growth- and maturity-related variables to performance in youth soccer (6). In a study performed with adolescent male Portuguese sub elite players, advanced skeletal maturity and higher body mass positively correlated with physical performance, whereas an increase in adiposity negatively correlated (7). Coaches and scouts can use this information to identify potentially exceptional players. However, rapid changes in anthropometrical and physiological characteristics during childhood and adolescence make it difficult to determine the most important factors involved in the achievement of athletic excellence (12, 15). To the best of our knowledge, no scientific literature was found significant predictor of agility tests used in soccer in terms of anthropometric characteristics. Therefore, the purpose of this research was to evaluate the significant predictor of agility tests used in soccer in term of age, height, weight, and body mass index.

MATERIAL &METHOD

Subject

One hundred sixty-nine healthy young male soccer players (10, 11, 12, 13 and 14 age) were examined. The mean (SD) age was 12.31±1.29 years, height was 153.28±9.79 cm, body weight was 44.18±10.30 kg, and BMI was 18.57±2.82 kg/m2 for the 169 young soccer players. Before conducting the experiment, all subjects were informed of the risks of the study and gave informed consent. The study was approved by a local ethics board and met the conditions of the Helsinki Declaration. For this study, approval was obtained from the non-invasive ethics committee of the Selçuk University Faculty of Sport Sciences.

Table 1. Descriptive statistics of the physical features and agility tests for young male soccer players

Variables	Mean±SD (N = 169)	Agility tests	Mean±SD (N = 169)
Age (y)	12.31±1.29	Pro_Agility (s)	5.77±0.39
Height (cm)	153.28±9.79	T Test (s)	13.13±1.34
Body weight (kg)	44.18±10.30	5-0-5 Agility test (s)	2.98±0.26
BMI (kg/m2)	18.57±2.82	Illinois test (s)	17.20±2.52

Procedures

In this study, Pro-agility test, 5-0-5 agility test, Illinois agility, and T test was used. The aims of all tests were explained to the players before the tests were conducted. The tests were started with a 20-minute warm-up session. While the tests were conducted, the same weather conditions were taken into consideration. This was followed by the administration of 5-0-5 agility test, pro-agility test, T test, and Illinois agility tests. Each test was applied twice, with a 3-minute interval, and the best result was recorded. There was a 5-minute rest session between each test. Cone, stopwatch, and tape measure for distance were used. The methodology employed during the tests is summarized in the following paragraphs.

5-0-5 agility test

This test evaluated the capacity of the subjects to quickly change direction. Cones were set up at 5 and 15 m from a line marked on the ground. The players assumed a starting position 10 m from the timing gates (i.e. 15 m from the turning point). The subjects ran from the 15-m marker (cone) toward the line (running at distance to build up speed) and through the 5 m markers, turned on the line, and ran back through the 5-m markers. The time was recorded from when the participants first ran through the 5-m marker and stopped when they returned through these markers (i.e., the time taken to cover the 5 m up and back distance – 10 m total). The participants were instructed not to overstep the line by too much, as this would increase their test duration (3).

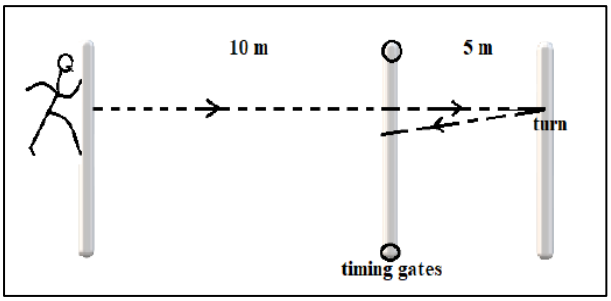

Figure1. Schematic representation of the 5-0-5 Agility test

The Pro-Agility test

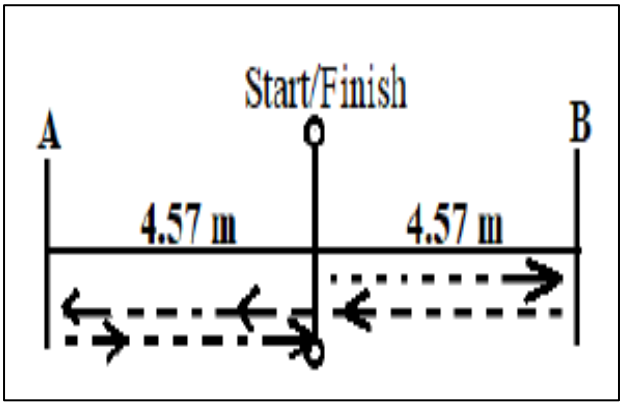

Figure 2. Schematic representation of the Pro agility test

The Pro-Agility test was set up and administered using the protocol outlined by Harman et al. (8). The subjects started in a neutral stance, straddling the start line. On the "Go" command, the subjects were instructed to turn and sprint to the right 4.57 m (5 yd), touching the cone with their right hand. They then turned to the left and ran 9.14 m (10 yd) to the far cone. The subjects touched this cone with their left hand and then sprinted 4.57 m (5 yd) to the finish.

T-Test

The T-Test was administered using a version standardized from previous literature (16, 23). The directions adopted for this study were based on (16). On the "go" command, the participant 1; ran or moved as quickly as possible forward to the center cone, 2; sidestepped to the left 4.57 m to the left cone, 3; sidestepped to the right 10 m to the far-right cone, and then 1; sidestepped back to the left to the center cone. The participant then ran or moved backward as quickly as possible to cross the finish line. The raters began the stop watch on "go" and stopped when the participant broke the plane of the finish line. The time to complete each trial was recorded in seconds. Disqualification was determined if the participant failed to run the course as instructed, failed to reach the finish line or complete the course, moved any cones, did not keep his trunk and feet pointed forward at all times, or crossed his legs more than once when sidestepping

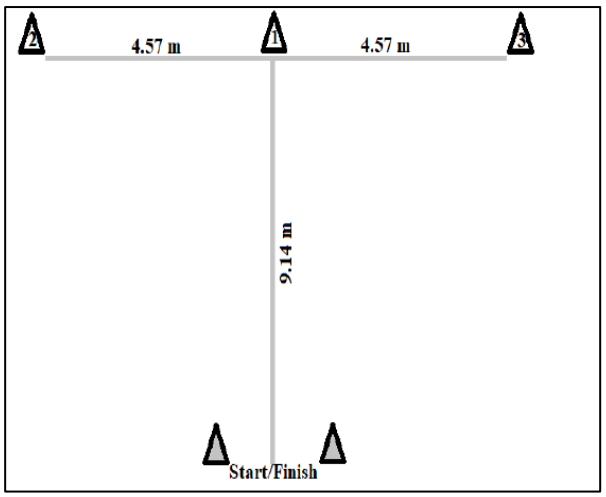

Figure 3. Schematic representation of the T test

Illinois Agility Test

The length of the Illinois agility test was originally set at 9.20 m. The IAT course was marked by cones, with four center cones spaced 3.07 m apart and four corner cones positioned 3.6 m from the center cones (27).

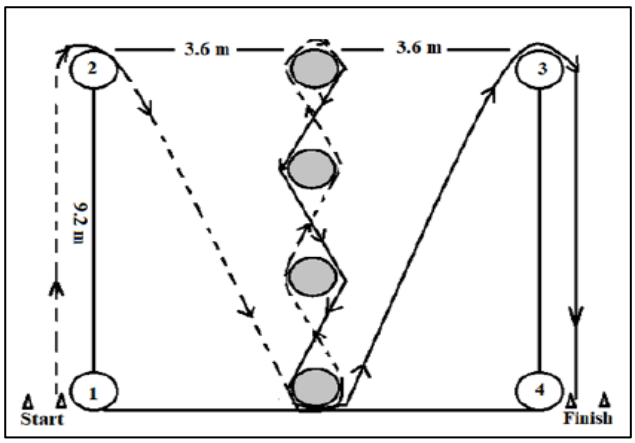

Figure 4. Schematic representation of the Illinois agility test

The participant began the test lying prone on the floor behind the starting line with his arms at his side and his head turned to the side or facing forward. On the "go" command, athlete begins and time starts when they cross the photocells. Get up and run the course in the set path (left to right to left). On the turn spots 2 and 3, be sure to touch the cones with your hand. Trial is complete when you cross the finish line and when no cones are knocked over. The time to complete each trial was recorded in seconds. Disqualification was determined if the participant failed to run the course as instructed, failed to reach the end lines, failed to complete the course, or moved any cones.

Statistical analysis

All statistical analyses were completed using the Statistical Package for the Social Sciences, version 22 IBM. Descriptive analyses were performed for physical characteristics and agility measurements. Data were presented as mean+SD. Relationship between variables was tested via Pearson correlation coefficient, with 95% confidence intervals (95% CI) being calculated for each agility variables and physical characteristic together. Normality was confirmed via the Kolmogorov-Smirnov test. Multiple regression analysis was performed to identify significant predictors of criterion measures of age, height, weight and BMI for Agility performance tests.

RESULTS

Table 2. Multiple Regression Analysis of Independent Variable Effects on Dependent Variables

Dependent Variables	Independent Variable	Coefficient	SE	t-value	P-value
Pro–Agility Test	Intercept	7.883	0.629	12.540	0.000*
	Age	-0.104	0.037	-2.850	0.005*
	Height	-0.011	0.006	-1.750	0.082
	Body weight	0.011	0.005	2.176	0.031*
	BMI	0.016	0.010	1.570	0.118
T test	Intercept	22.926	1.938	11.830	0.000*
	Age	-0.617	0.113	-5.464	0.000*
	Height	-0.040	0.019	-2.159	0.032*
	Body weight	0.058	0.015	3.816	0.000*
	BMI	0.073	0.032	2.267	0.025*
5-0-5 Agility test	Intercept	4.720	0.424	11.125	0.000*
	Age	-0.017	0.025	-0.673	0.502
	Height	-0.015	0.004	-3.781	0.000*
	Body weight	0.014	0.003	4.112	0.001*
	BMI	0.011	0.007	1.584	0.115
Illinois Agility test	Intercept	31.618	3.974	7.956	0.000*
	Age	-0.809	0.232	-3.493	0.001*
	Height	-0.078	0.038	-2.041	0.043*
	Body weight	0.102	0.031	3.276	0.001*
	BMI	0.157	0.066	2.369	0.019*

It is observed that the change in agility performance improved after 12 years of age.

Body weight was significant predictor of Pro-Agility, 5-0-5 agility test, T test, and Illinois Agility test while Age was significant predictor of Pro-agility, T test, and Illinois agility test. Also, height was significant predictor of 5-0-5 agility test, T test, and Illinois agility test. On the other hand, BMI was significant predictor of T test and Illinois agility test.

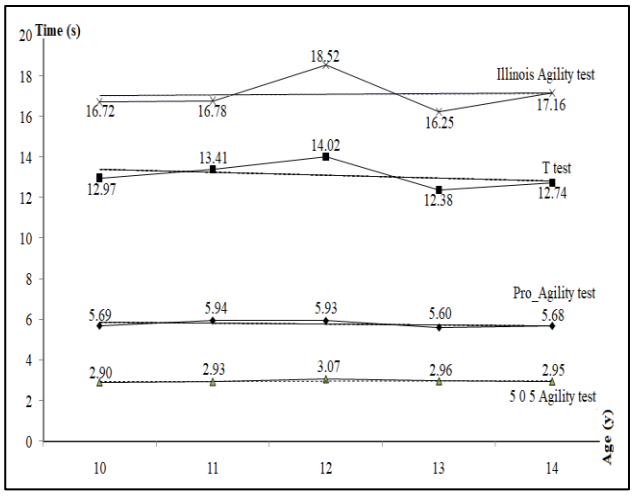

Figure 5. Change graph of agility performances according to age groups.

DISCUSSION

In this study conducted to investigate the agility performance of young male soccer players in anthropometric variables. Body weight was significant predictor of Pro-agility, 5-0-5 agility test, T test, and Illinois agility test. Age was significant predictor of pro-agility, T test, and Illinois agility test. Height was significant predictor of 5-0-5 agility test, T test, and Illinois agility test. BMI was significant predictor of T test and Illinois agility test.

A previous study examined if anthropometry and performance were different amongst older and younger soccer players born in the same year. Older boys performed better in agility ($P<0.05$). Also, the study revealed that chronological age was the most important variable in the agility test (6). Vescovi et al (26) described the physical performance characteristics of female soccer players ranging in age from 12 to 21 years. The 12-13 years-old players had slower scores on both agility tests (pro-agility = 5.40 ± 0.28 s and Illinois = 11.22 ± 0.60 s) compared with all other ages and there was the tendency for younger athletes (e.g., 13-15 years old) to have slower times on the agility tests compared with the older athletes (e.g., 17-20 years old). Performance on

both agility tests showed the largest change between 12 and 13 years, and then modest improvements were observed until 15-16 years when a plateau occurred. Between the three age groups pro-agility scores were stable after 12-13 years; however, there was a continued improvement across each group for the Illinois test. In a previous study of the contribution of chronological age, age at peak height velocity, body size, and body composition to physical performance among young elite soccer players of different age groups, chronological age was the primary predictor of physical performance within both age-groups (under 12 and under 13). Specifically, chronological age was a significant performance predictor for modified Barrow's agility test in the U-12 group and the U-13 group (2). Similarly, in our study revealed that the change in agility performance improved after 12 years of age in all agility tests. The study of Forsman et al. (4) in which they found an average height increase of 7.1 cm in a 12-month period. In the ages between 12 and 15 years is characterized as the second phase of running speed development, and strength increases with stride length, height and muscle development, and sprint because of this performance improves (21). In a study, when we look at the relationship between the mean height of the subjects according to their age groups and the means of T test and The Illinois Agility tests, there were significant differences as statistically. A study which conducted with 12- year-old boys, significant relationship was found between 50 m speed and height (1). Similarly, in this study observed that the change in agility performance improved after 12 years of age. In young athletes, strength and lower extremity power, anthropometric variables, perceptual and decision-making processes and running speed on a straight line will significantly contribute to agility performance (11). Furthermore, a number of rapid age-related biological and social changes occur that can affect the motivational and performance characteristics of young players throughout puberty (9,10). Some researchers revealed that sprint performance development is link to neural system maturation and improved muscle/ neuralization as well as increase in muscle mass (13,15). In this study, when we look at the relationship between the mean height of the subjects according to their age groups and the means of 5-0-5 agility, T test and The Illinois Agility tests, there was significant differences as statistically. Almuzaini (1) was found significant relationship between 50 m speed and height12- year-old boys. In the ages between 13 and 15 years the largest difference in sprint is related to variation in body height and also sprint performance has shown the largest improvement around the peak height velocity (12,22). In a study among young soccer players, shown that taller players performed better in 10 m and 30 m sprint among 14-year-old males (28). In another study, with 12-year-old boys, found a significant correlation between the 50 m sprint and height (1). The peak rate of development of agility performance occurs at approximately the age of 13-14 years in male youths, which is at the time of PHV (25). In the growth spurt, the variations in maturation for the same chronological age have been shown be as much as 2 or 3 years, or even more, and (13), suggest that body mass and maturity account for 50% of variance in short sprint in 13- to 15-year-old soccer players. In this age period, a small difference in maturation may imply a substantial difference in body height and weight, associated with a huge difference in sprint performance (6). It has been observed that the ability of repeated sprint test in the 11-18 age range didn't change with age in a well-trained soccer player (18). Also, with previous studies shown that there are positive relation between anthropometric characteristics (e.g. body mass and stature) sprint performance (14). BMI did not correlate significantly to any performance variables in this study; however, BMI measurements have shown to be related to body fat among adolescent soccer players (19). Body fat to be significantly lower in 9- to 14-year-old soccer players than in a control group and, as a consequence, BMI should be connected to body fat measurement (17). And also, soccer players who has higher BMI values performed better in 30-m sprint (27). In the present study, if the players have higher BMI they showed significant test score in Illinois agility test and T test. Peak height (5%) and weight (14.1%) values were observed in young European soccer players when they reached the age of 14 (25), this finding also supported previous studies (22). In addition, Malina et al (12) considering the findings in the general population, the muscle mass in proportion to the total body weight increased from 47.8% at the age of 11 to 51.9% by the age of 17. Furthermore, with peak height and weight attacks occuring between the ages of 13-14, improvement was observed in speed (5.2%) and agility (3.8%) performances (25). Similarly, in this study, players who higher body weight has performed better in all agility tests.

In conclusion, in this age period, a small difference in maturation may imply a substantial difference in body height and weight, associated with a huge difference in agility performance.

REFERENCES.

1. Almuzaini K. Optimal Peak and Mean Power on the Wingate Test: Relationship with Sprint Ability, Vertical Jump and Standing Long Jump in Boys. Pediatric exercise science, 2000; 12, 349-359. doi:10.1123/pes.12.4.349.
2. Bidaurrazaga-Letona I, Lekue JA, Amado M, Gil SM. Does a 1-Year Age Gap Modify the Influence of Age, Maturation, and Anthropometric Parameters as Determinants of Performance Among Youth Elite Soccer Players? J Strength Cond Res, 2019; 33(9), 2541-2547. doi:10.1519/jsc.0000000000002203.
3. ChaalaliA, Rouissi M, Chtara M, Owen A, Bragazzi N, Moalla W, Chaouachi A, Amri A, Chamari K. Agility training in young elite soccer players: Promising results compared to change of direction drills. Biology of Sport, 2016; 33, 345-351. doi:10.5604/20831862.1217924.
4. Forsman H, Gråstén A, Blomqvist M, Davids K, Liukkonen J, Konttinen N.Development of perceived competence, tactical skills, motivation, technical skills, and speed and agility in young soccer players. J Sports Sci, 2016; 34(14), 1311-1318. doi:10.1080/02640414.2015.1127401.
5. Gambetta V. How to develop sport-specific speed. Sports Coach, 1996; 19(3), 22-24.
6. Gil S, Ruiz F, Irazusta A, Gil J, Irazusta J. Selection of young soccer players in terms of anthropometric and physiological factors. J Sports Med Phys Fitness, 2007; 47(1), 25-32.
7. Gil SM, BadiolaA, Bidaurrazaga-LetonaI, Zabala-Lili J, Gravina L, Santos-Concejero J, Lejue JA, Granados C.Relationship between the relative age effect and anthropometry, maturity and performance in young soccer players. J Sports Sci,2013; 32(5), 479-486. doi:10.1080/02640414.2013.832355.
8. Harman E, Garhammer J, Pandorf C. Essentials of strength and conditioning. Champaign, IL: Human Kinetics (E. R. Baechle TR Ed.). Champaign, IL: Human Kinetics: Essentials of strength and conditioning. 2000.
9. Harter S. The construction of the self: Developmental and sociocultural foundations: Guilford Publications.2015.
10. Horn TS. Developmental Perspectives on Self-Perceptions in Children and Adolescents. In Developmental sport and exercise psychology: A lifespan perspective. (pp. 101-143). Morgantown, WV, US: Fitness Information Technology. 2004.
11. Lloyd R, Read P, Oliver J, Meyers R, Nimphius S, Jeffreys I.Considerations for the Development of Agility During Childhood and Adolescence. Strength and Conditioning Journal, 2013; 35, 2-11. doi:10.1519/SSC.0b013e31827ab08c.
12. Malina RM, Bouchard C, Bar-Or O. Growth, Maturation, and Physical Activity: Human Kinetics. 2004.
13. Malina RM, Eisenmann JC, CummingSP, Ribeiro B,Aroso J. Maturity-associated variation in the growth and functional capacities of youth football (soccer) players 13-15 years. Eur J Appl Physiol, 2004; 91(5-6), 555-562. doi:10.1007/s00421-003-0995-z
14. Mero A.Power and speed training during childhood. Pediatric anaerobic performance, 1998; 241-269.
15. Meylan C, Cronin J, Oliver J, Hughes M. Reviews: Talent Identification in Soccer: The Role of Maturity Status on Physical, Physiological and Technical Characteristics. International Journal of Sports Science and Coaching, 2010; 5, 571-592. doi:10.1260/1747-9541.5.4.571.
16. Miller MG, Herniman JJ, Ricard MD, Cheatham CC,Michael TJ. The effects of a 6-week plyometric training program on agility. J Sports Sci Med, 2006; 5(3), 459-465.
17. Moreno L, León J, Serón R, Mesana M, Fleta J.Body composition in young male football (soccer) players. Nutrition Research, 2004; 24, 235-242. doi:10.1016/j.nutres.2003.10.006.
18. MujikaI, Santisteban J, Impellizzeri F, Castagna C. Fitness determinants of success in men's and women's football. Journal of sports sciences, 2009; 27, 107-114. doi:10.1080/02640410802428071
19. Nikolaïdis PT. Prevalence of overweight, and association between body mass index, body fat percent and physical fitness in male soccer players aged 14-16 years. Science & Sports, 2013; 28(3), 125-132.
20. Okur M, Taskin H, Taskin M.Effects of Speed Training Over the Agility, Quickness And Acceleration For Young Basketball Players. Kinesiologia Slovenica, 2019; 25(3).
21. Papaiakovou G, Giannakos A, Michailidis C, Patikas D, Bassa E, Vassilios K, Anthrakidis N, Kotzamanidis C.The effect of chronological age and gender on the development of running speed phases during developmental ages. National Strength & Conditioning Association Journal, 2009; 23, 2568-2573.
22. Philippaerts RM, Vaeyens R, Janssens M, Van Renterghem B, Matthys D, Craen R, Bourgois J, Vrijens J, Beunen G, Malina RM. The relationship between peak height velocity and physical performance in youth soccer players. J Sports Sci, 2006; 24(3), 221-230. doi:10.1080/02640410500189371.
23. Semenick D. Testing protocols and procedures. In: Baechle T, editor. Essentials of strength training and conditioning. 1st ed. Champaign (IL): Human Kinetics; 1994. p. 258-73.
24. Sheppard JM, Young WB. Agility literature review: classifications, training and testing. J Sports Sci, 2006; 24(9), 919-932. doi:10.1080/02640410500457109.
25. Vänttinen T, Blomqvist M, NymanK,Häkkinen K. Changes in body composition, hormonal status, and physical fitness in 11-, 13-, and 15-year-old Finnish regional youth soccer players during a two-year follow-up. J Strength Cond Res, 2011; 25(12), 3342-3351. doi:10.1519/JSC.0b013e318236d0c2.
26. Vescovi JD, Rupf R, Brown TD,MarquesMC.Physical performance characteristics of high-level female soccer players 12-21 years of age. Scand J Med Sci Sports, 2011; 21(5), 670-678. doi:10.1111/j.1600-0838.2009.01081.x.
27. Wilkinson M, Leedale-Brown D, Winter EM. Validity of a squash-specific test of change-of-direction speed. Int J Sports Physiol Perform. 2009 Jun;4(2):176-85. doi: 10.1123/ijspp.4.2.176. PMID: 19567921.
28. Wong PL, Chamari K, Dellal A,Wisløff U. Relationship between anthropometric and physiological characteristics in youth soccer players. J Strength Cond Res, 2009; 23(4), 1204-1210. doi:10.1519/JSC.0b013e31819f1e52.

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The Effects of Exercise on Antioxidant System and Some Blood Parameters at Experimental Diabetic Rats

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Abstract

The aim of this study is to determine the effects of exercise on antioxidant system (MDA, SOD, GSH) and some blood parameteres (plasma insuline, glucose, ALT, AST) in rats with experimental diabetes induced by streptozotocin (STZ).

In the study, 32 adult Wistar Albino rats were divided into 4 equal groups as control (C), exercise (E), diabetes (D) and diabetes+exercise (DE). Diabetes was induced in D and DE by intraperitoneal injection with a single dose of 60 mg/kg STZ. After the diabetes was induced, swimming exercise was applied to E and DE for 5 days / 30 min a week for 4 weeks. According to the findings obtained; there was a significant decrease in D and DE compared to C. Plasma glucose levels decreased in DE with exercise in the diabetic groups. While ALT levels increased significantly in diabetic groups compared to others, it was found that exercise did not make a difference in diabetics. However, the increase in AST levels was statistically significant only in D. When serum MDA levels were examined, a significant decrease was observed in DE compared to D. While there was a significant decrease in serum SOD levels in the diabetic groups compared to C. The diabetic groups and DE and E were similar to each other. A significant decrease was observed in GSH levels in D. This difference was also detected between diabetic groups.As a result; in the study it was concluded that regular aerobic exercise improved glycemic control, has a lipid peroxidation-reducing effect and may hava a positive effect on strengthening the antioxidant system in diabetes.

Key Words: Antioxidants; Exercise; Diabetes Mellitus; Blood Parameters.

INTRODUCTION

Diabetes Mellitus (DM) is a chronic metabolism disease that adversely affects carbonhydrate, fat and protein metabolism due to acute and chronic complications as a result of insufficient insulin secretion and impairment of the response of the relevant tissues to insülin (30). It is known that oxidative stress due to hyperglycemic plays an important role in diabetes and the emergence of diabetic complications (31). The extent of oxidative damage that may occur during physical exercises is also determined by the defense capacity of antioxidants such as SOD, GSH, and CAT. It has been stated that an acute exercise can negatively affect the activities of these enzymes (5, 48). It has been reported that regular aerobic exercise in diabetic patients provides blood glucose regulation, increases the sensitivity of cells to insulin, reduces lipid levels, facilitates weight loss, improves the cardiovascular system and metabolic control (32).

Various experimental diabetes models are created using various experimental animals in order to examine disease prevention and treatment options in diabetes. In these models, experimental

animals such as mice and rats are generally preferred, and chemicals such as alloxan and streptozotocin (STZ), which cause oxidative stress-induced destruction in β cells with low antioxidant capacity, are used to cause diabetes (13). In this context, the effect of exercise on blood parameters such as plasma insulin, glucose, ALT and AST, and SOD and GSH levels, which are the end products of lipid peroxidation, and antioxidant system parameters, were investigated in rats with STZ-induced diabetes.

MATERIAL and METHODS

Subjects

In the study, 32 healty male Wistar Albino rats weighing an avarage of 300 g, 70-80 days old were used. The rats have been provided from the KONUDAM (Experimental Medicine Application and Research Center of Necmettin Erbakan University). The research design was approved by the KONUDAM Ethics Committee for Animal Studies (Ethics Code: 2014-043). The rats were housed in plastic rat cages in the experimental animal unit at 23 ± 2 oC at room temperature and in a 50±10% humidified environment at a 12/12 night/day light cycle and they were fed ad-libitum with a standard rat diet. Rats were provided ad libitum access to water (~ 50 ml/day/rat) to be refreshed daily for four weeks. The animals were divided into four groups as control (C), diabetes (D), exercise (E) and diabetes + exercise (DE), 8 rats in each group.

Induction Of Diabetes

A single dose of streptozotocin (STZ) (60 mg/kg, Sigma S0130-1G) solution was injected intraperitoneally in rats and a diabetes model was created in diabetic groups (D, DE) (3). Group E and DE trained 5 d/week for 4 weeks. The STZ solution was prepared by dissolving 60 mg / kg STZ (Sigma S0130-1G) in 0.1 M citrate buffer (pH 4.5) before application. After STZ injection, checking blood glucose was done after 72 h fast from the tail with blood glucose meters (plusMED). All the animals who obtained blood glucose above 250 mg/dl were contemplated diabetic. After 4 weeks of application, blood samples were taken from the animals by cardiac puncture under anesthesia into anticoagulant for determination.

Swimming Training Protocol

In the study, after the occurrence of diabetes, swimming exercise was applied to the E and DE groups in a tank (180 cm diameter and 80 cm depth) with water at 22-25 °C, 5 days/30 minutes per week for 4 weeks.

Determination Of Hematological Parameters

Plasma samples were kept at -80 C0 until analyzed, insulin, glucose, ALT and AST levels were determined in the "Siemens CentaurXP Immunoassay System" device using commercial kits (Siemens). In serum samples obtained after the research, MDA levels, a lipid peroxidation product, were determined using Oxis (USA) branded commercial kit, and antioxidant parameters such as SOD and GSH levels were determined in the "Biotek ELX 800 ELISA" device using the "Cayman Chemical Company" (USA) brand kit.

Statistical Analyses

Statistical analysis of the obtained findings and determining the importance of the differences between the groups were made using the SPSS 16.0 package program. The significance between groups was determined Duncan's Multiple Range test in analysis of variance (ANOVA). Significant was considered as $P<0.05$.

RESULTS

In this study, the effects of exercise on some hematological parameters were summarized Table 1 and 2.

Table 1. Plasma insulin, glucose, ALT and AST levels (n=32).

Parameters	Control	Exercise	Diabetes	Diabetes+Exercise	p Value
Insulin (uU/ml)	0,73 ± 0,40 a	0,52 ± 0,14 ab	0,22 ± 0,84 c	0,32 ± 0,17 bc	<0.05
Glucose (mg/dl)	140,50± 30,17 c	167,50± 28,57 bc	411,67 ± 117,74 a	246,50± 93,68 b	<0.05
ALT (U/L)	57,67 ± 8,07 b	59,33± 8,59 b	102,17 ± 26,29 a	82,83± 20,59 a	<0.05
AST (U/L)	88,17 ± 9,28 b	88,50± 8,87 b	144,17 ± 45,70 a	103,00± 21,58 b	<0.05

a, b, c; p<0.05. ALT: Alanine aminotrasdferase, AST: Aspartate aminotransferase

According to the table 1, insulin, plasma glucose in the diabetic groups showed a significant decrease in the D group compared to the C and E groups and in the DE group compared to the C group. In addition, it was determined that the exercise practice decreased glucose level in the DE group compared to the D group.

When Plasma ALT and AST levels were examined, it was found that there was an increase in the D and DE groups compared to the other groups, while a significant increase was found in only AST levels among the diabetic groups.

Table 2. Serum MDA and some antioxidants (SOD, GSH) levels (n=32)

Parameters	Control	Exercise	Diabetes	Diabetes+Exercise	P Value
MDA (nmol/ml)	0,97 ± 0,33 c	1,05 ± 0,24 c	2,79 ± 0,05 a	1,89 ± 0,31 b	<0.05
SOD (U/ml)	0,52± 0,12 a	0,47 ± 0,16 ab	0,30 ± 0,73 c	0,39 ± 0,31 bc	<0.05
GSH (μM)	5,02 ± 1,32 a	4,98 ± 1,90 a	1,07 ± 0,60 c	2,64 ± 0,96 b	<0.05

a, b, c: P<0,05, MDA: malodialdehite, SOD: superoxide dismutase, GSH: Gluatation

In the study, it was observed that serum MDA levels, an indicator of oxidative damage, increased in diabetic groups. When the diabetic groups were compared, it was determined that the exercise applied to the DE group significantly decreased the MDA levels.

It was observed that serum SOD and GSH levels decreased in diabetic groups. However, it was observed that SOD and GSH levels increased in the DE group compared to the D group, depending on the exercise, although this increase in the SOD level was limited to only numerical frames (p>0.05), the increase in GSH level was statistically significant.

DISCUSSION and CONCLUSIONS

An increase in blood glucose levels above 250 mg/dl in rats or other laboratory animals in STZ administrations at doses of 40, 50, 60, 100 mg / kg for single injection is considered as an indicator of the development of experimental diabetes. In the present study, in order to induce experimental diabetes, a single dose of 60 mg/kg STZ was administered to animals by intraperitoneal injection, and animals with blood glucose values higher than 250 mg / dl were considered diabetic (10, 36, 42).

In the study, decrease in plasma insulin levels and increase in glucose levels in diabetic groups (D, DE) were accepted as indicators of destruction in pancreatic β cells.

Plasma insulin levels determined in the study were similar between diabetic groups. This finding was similar to Ahmadi et al. report that the 8-week aerobic exercise they applied in female athletes "did not differ after exercise insulin levels compared to before" (2). Cicioğlu and Onay stated that high intensity exercise lowers insulin values in wrestlers (11).

Differently, it is reported that insulin levels increase after sprint exercise and decrease after endurance exercise, after two different acute exercise methods applied to elite athletes (53).

Similarly, RamzanPour et al. (39) stated that 12-week aerobic swimming exercise in type II diabetic women decreased the plasma insulin level; They

attribute this decrease to "exercise practice in diabetes reduces insulin resistance".

It was concluded that the reason why the findings obtained in the study differed from some of the mentioned literature reports might be due to the metabolic difference between humans and experimental animals or the differences in the type, intensity and duration of the exercise.

When glucose parameters were examined, it was an expected result to increase serum glucose levels in diabetic groups in. As a matter of fact, the results obtained were in agreement with the literature datas (22, 33, 53). However, Ahmadi et al. (2) reported that glucose levels do not differ after aerobic exercise.

In the study, the decrease in plasma glucose level in the DE group compared to the D group; It was attributed to increased insulin sensitivity due to exercise and increased glucose uptake by muscles due to depletion of glycogen stores.

In addition, it is common for diabetic patients to decrease blood glucose level during exercise (41). It is stated that it may be associated with insufficient hepatic glucose production and / or decreased sympathetic nervous system activation (29). Apart from these factors, it has been noted that some other factors such as the duration and type of exercise, the content of the diet and the time taken may also have an effect on the plasma glucose level (47).

ALT and AST enzyme activities are routine biochemical markers especially used in the evaluation of liver damage (21). In studies investigating the effect of exercise on liver enzyme levels, various exercise programs applied to athletes in different branches and after the competition reported an increase in liver enzyme levels, although some studies reported no change in enzyme levels (7, 21, 28, 40).

In the study, it was determined that plasma ALT and AST levels increased in diabetic groups. This finding was in line with reports that serum aminotransferase levels are generally high in individuals with diabetes (38). On the other hand, Can et al. (9) reported that ALT levels were higher in rats in which they had experimental diabetes. Tanaka et al. (45) detected a cytosolic induced shot in AST activity in diabetic mice. Again, in similar studies, it was reported that ALT and AST values were increased in diabetic rats treated with STZ and liver enzyme activities were affected (23, 52).

In studies examining ALT and AST levels, Valizadeh et al. (49) reported that swimming exercise reduced ALT and AST levels in men with fatty liver and aerobic exercise was effective in this reduction. RamzanPour et al. (39) reported that 12-week aerobic swimming exercise caused a decrease in AST and ALT values in type II diabetic women.

It was observed that the findings regarding plasma ALT and AST levels obtained in the presented study were similar to those studies. In the study, the decrease in plasma ALT and especially AST levels in diabetic groups; It was interpreted that "regular aerobic exercise reduces or may have a protective effect in liver, skeletal muscle and possibly heart cells damage in diabetes".

Oxidative stress induced by hyperglycemia plays an important role in the development of diabetes and diabetes-related complications (14). In diabetes, it has been reported that free radical formation increases and the effectiveness of antioxidant enzymes is reduced as a result of sorbitol pathway activity, metabolic stress, hypoxia and ischemia-reperfusion, especially non-enzymatic glycation (4).

The amount of free radicals generated during exercise varies depending on the type, weight and duration of physical exercise (20). Hara et al. (15) reported that swimming exercise in rats increased lipid peroxidation in the liver and skeletal muscle, and Temiz et al. (46) reported that acute exercise increased lipid peroxidation in rats. Similarly, Semin et al. (43) reported that 60 minutes of running exercise in mice increased lipid peroxidation in skeletal muscle and kidney.

In the study, it was observed that exercise application decreased serum MDA level in the DE group compared to the D group. This finding was attributed to the fact that aerobic exercise in diabetes increased resistance to lipid peroxidation by reducing the production of free oxygen radicals, thus reducing oxidative protein damage and DNA damage.

As a matter of fact, although acute or exhaustion exercise increases free radical production, it has been reported that regular exercise improves antioxidant enzyme activities and decreases free oxygen radical production and MDA levels (12).

In studies examining the effect of exercise on SOD activity, which is one of the important antioxidants in the body, Powers et al. (34) state that treadmill training increases SOD activity in rats. Burneiko et al. (8) noted that 8 weeks of exercise increased SOD values in liver tissues in rats. Similarly, Qiao et al. (37) reported that anaerobic swimming exercise resulted in increased SOD activity in skeletal muscle and heart tissue in rats, while Lima et al. (26) reported an increase in SOD activity in rats after 6 weeks of aerobic swimming exercise. On the other hand, in some studies using similar animal models, there are also reports that there is not change SOD activity (17, 25).

There are also different reports in studies investigating the effect of exercise on GSH level, which is an important component of the antioxidant defense system and ensures the preservation of membrane integrity in the cell system.

Venditti et al. (50) noted that the 10-week swimming program increased the GSH activity in rats. Similarly, some studies (18, 19) reported that exercise increases GSH levels in different tissues, while others (16, 44) have been reported to decrease it. Indeed, Lima et al. (26) also found that the GSH values decreased in rats after 6 weeks of aerobic swimming exercise. Liu et al. (27) reported that 8-week chronic exercise in rats did not make a difference on heart tissue GSH levels.

It has been reported that the antioxidant system parameter levels are decreased in many studies conducted on people with diabetes and rats with experimental diabetes. Kuyvenhoven and Meinders (24) state that in diabetic patients, GSH values are generally low in parallel with oxidative stress and the amount of free radicals. Adewole et al (1) reported that plasma SOD, CAT, GPx activities were significantly decreased in rats with STZ in which they had experimental diabetes.

In the study, the lowest serum SOD and GSH levels among all groups were determined in group D. The decrease in antioxidant capacity in animals with experimental diabetes with STZ confirms the relationship between diabetes and oxidative stress.

It is stated that exercise improves glycemic control (decreases blood glucose level, increases glucose tolerance), decreases the need for exogenous insulin, increases the number of insulin receptors, and decreases stress and anxiety in diabetic patients (4).

Biçer (6) found that acute swimming exercise decreased erythrocyte GSH and serum SOD values in a study conducted on Spraque Dawley male rats with diabetes induced by STZ; As a result, he states that acute swimming exercise suppresses antioxidant activity.

It was observed that the mean serum SOD and GSH levels determined in the study increased in the diabetic groups in the exercise group DE. However, this increase was observed to be statistically significant only in serum GSH level. This finding was similar to the report of Villa-Caballero et al. (51) That "regular exercise causes an increase in antioxidant activity in diabetics, and thus facilitates the rendering of reactive oxygen species".

In the study; increased levels of antioxidant parameters in diabetic groups; "Regular and continuous aerobic exercise can strengthen antioxidant defenses in diabetic patients". In conclusion of the study, the findings regarding plasma glucose and liver enzymes were interpreted as continuous aerobic exercise improved glycemic control in diabetes and thus reduced damage to liver, skeletal muscle and possibly hearth cell.

In addition, it has has been concluded that long-term aerobic has the effect of reducing lipid peroxidation, exercise performed within the framework of the regular loading principles can have a positive effect in strengthening the antioxidant system and can contribute to maintaining a healty life. In terms of cinfirming this issue, it was concluded that it would be beneficial to conduct studies in which the exercise period is applied longer.

REFERENCES

1. Noyan A. Yaşamda ve hekimlikte fizyoloji. Meteksan, 1993, p 1058-66 Ankara,
2. Öntürk H, Özbek H. Carried out of experimental diabetes and the measurement of glycemic activity. J General Med, 2007, 17(4):231-36.
3. Baynes JW, Thorpe SR. Role of oxidative stress in diabetic complications: A new perspective on an old paradigm. Diabetes, 1999, 48 (1), 1-9.
4. Urso ML, Clarkson PM. Oxidative stress, exercise and antioxidant supplementation. Toxicology, 2003, 189:41-54.
5. Packer, L. Oxidants, antioxidant nutrients and the athlete. J Sports Sci, 1997, 15:353-63.
6. Deaton CM, Marlin DJ. Exercise-associated oxidative stress, Clin TechEquine Pract, 2003, 2:278-91.
7. Akbarzadeh A, Norouzian D, Mehrabi MR, Jamshidi Sh, Farhangi A, Allah Verdi A, Mofidian SMA, Lame Rad B. Induction of diabetes by Streptozotocin in rats. Ind J Clin Biochem, 2007, 22, 60-64.
8. Cetto AA, Wiedenfeld H, Revilla MC, Sergio IA. Hypolgycemic effect of Equisetum myriochaetumaerial parts on streptozotocin diabetic rats. J Ethnopharmacol, 2000, 72:129-33.
9. Pushparaj P, Tan CH, Tan BKH. Effects of averrhoa bilimbi leaf extract on blood glucose and lipids in streptozotocin diabetic rats. J Ethnopharmacol, 2000, 72:69-76.
10. Sanders RA, Rauscher FM, Watkins JB. Effects of quercetin on antioxidant defense in streptozotocin-ınduced diabetic rats. Inc. J Biochem Mol Toxicol, 2001, 15,143-49.
11. Valizadeh R, Nikbakht M, Davodi M, Khodadoost M. The effect of eight week selected aerobic exercise on the levels of (AST,ALT) enzymes of men patient with have fat liver. Procedia Soc Behav Sci, 2011,15, p. 3362-65.
12. Ahmadi N, Moghadasi M, Nuri R. Changes of serum retinolbinding protein 4 levels following 8 weeks moderate aerobic exercise. Asian J Sports Med, 2013, Vol 4 (3).
13. Cicioğlu İ, Onay M. The effects of high intensity exercise on blood gases and some blood parameters. J Physic Edu Sport Sci, 2002, 4 (3), s. 26-30.
14. Zeinali S, Nodoushan IS, Firouzian A, Marandi SM, Aghajani H, Mazreno AB. The influence of the session of intensive physical activity on the amount of testosterone, cortisol, insulin and glucose hormone in elite athletes blood serum hemostat. Acta Kinesiologica, 2012, 6, 2: 47-51.
15. RamzanPour MR, Mousavian S, Hejazi SM. The effect of 12 weeks of selective aerobic exercise on insulin resistance and hepatic enzymes in middle-aged type II diabetic women. Int J Sport Studies, 2014, 4 (5), 508-13.
16. Phillips SM, Stewart BG, Mahoney DJ, Hicks AL, McCartney N, Tang JE, Wilkinson SB, Armstrong D, Tarnopolsky MA. Body-weight-support treadmill training improves blood glucose regulation in persons with incomplete spinal cord injury. J Appl Physiol, 1985, 97: 716–20.
17. Kratz A, Kent B, Lewandrowski MD, Siegel AJ, Kelly YC, James GF et al. Effect of marathon running on hematologic and biochemical laboratory parameters, Including Cardiac Markers from American J Clin pathol, 2002, post 3 (3) 45–6.
18. Rowland TW. Pediatric exercise medicine from physiologic principles to healt care application, 1. ed, ABD: Sheridan Books, 2004, 219-36.
19. Nordfelt S, Ludvinsson J. Fear and other disturbances of severe hypoglycaemia in children and adolescents with type 1 diabetes mellitus. J Pediatr Endocrinol Metab, 2005, 18;83–91.
20. Temple MY, Bar-Or O, Riddell MC. The reliability and repeatability of the blood glucose response to prolonged exercise in adolescent boys with IDDM. Diabetes Care, 1995, 18;326–32.
21. Pratt DS, Kaplan MM. Evaluation of the liver (Laboratory tests). In: ER: Schiff, MF. Sorrell, WC.Maddrey, Editors. Diseases of the Liver. Volume 1, Eight ed. Philadelphia, Lippincott-Raven,1999, 205-44.
22. Rosmarin MN, Beard MJ, Robbins SW, 1993. Serum enzyme activities in individuals with different levels of physical fitness. J Sports Med Physic Fitn,1999, 33:252-257.
23. Marcos Bürger-Mendonça, Bielavsky M, Fernanda CR Barbosa. Liver overload in Brazilian triathletes after halfironman competition is related muscle fatigue. Ann Hepatol, 2008, 7:245-48.
24. Bijeh N, RashidlamirA, Sadeghynia S, Hejazi K. The effect of eight weeks swimming training on hepatic enzymes and hematological values in youngfemale. Int J Basic Sci&App Res, 2013, 2 (1), p.123-28.
25. Kaynar Ö, Öztürk N, Kıyıcı F, Baygutalp NK, Nakan E. The effects of short-term ıntensive exercise on levels of liver enzymes and serum lipids in kick boxing athletes. Dicle J Med, 2016, 43 (1):130-34.
26. Rajasekaran S, Ravi K, Sivagnanam K, Subramanian S. Beneficial effects of aloe vera leaf gel extract on lipid profile status in rats with streptozotocin diabetes. Clin Exp Pharmacol Physiol, 2006, 33(3):232-37.
27. Can A, Akev N, Ozsoy N, Bolkent S, Arda BP, Yanardağ R, Okyar A. Effect of aloe vera leaf gel and pulp extracts on the liver in typeII diabetic rat models, Biol Pharm Bull, 2004, 27, 5, 694-98.
28. Tanaka K, Nanbara S, Koide H and Hayashi T. Aminotransferase activity in the liver of diabetic mice, Diabetes Res Clin Practice, 1988, 5, 71-75.
29. Kusunkoi M, Tsutsumi K, Inove Y, Hara T, Miyata T, et al. Lipoprotein lipase activator no-improves fatty liver caused by high-fat feeding in streptozotocin-induced diabetic rats, Metabolism, 2004, 53, 2, 260-63.
30. Zafar M, Naqvi SN, Ahmed M, Kaimkhani ZA. Altered liver morphology and enzymes in streptozotocin ınduced diabetic rats. Int J Morphology, 2009, 27: 719-25.
31. Goh S, Cooper ME. The role of advanced glycation end products in progression and complications of diabetes. J Clin Endocrinol Metab, 2008, 93 (4): 1143-152.
32. American Diabetes Association (ADA). Diagnosis and classification of diabetes mellitus. Diabetes Care, 2012, 35, s.64-71.
33. Jenkins RR. Exercise and oxidative stress metodology: a critique. Am J Clin Nutr, 2000, 72: 670-74.
34. Hara M, Ligo M, Othani-Kaneko R, Nakamura N, Suzuki T, Reiter RJ, Hirata KAdministration of melatonin and related indoles prevents exercise-induced cellular oxidative changes in rats. Biol Signals Recept, 1997, 6: 90- 100.
35. Temiz A, Başkurt OK, Pekçetin C, Kandemir F, Güre A. Leukocyte activation, oxidant stress and red blood cell properties after acute, exhausting exercise in rats. J Clin Hemorheol Microcirc, 2000, 22:253–59.
36. Semin I, Kayatekin BM, Gönenç S, Açıkgöz E, Uysal N, Delen Y, Güre A. Lipid peroxidation and antioxidant enzyme levels of intestinal and muscle tissues aftere a 60 minutes exercise in trained mice, Ind J Physiol Pharmacol, 2000, 44:419-27.
37. Clarkson PM. Antioxidant and physical performance. Crit Rev Food Nutr, 1995, 35: 131-41.
38. Powers SK, Criswell D, Lawler J, Martin D, Lieu FK, Ji LL, Herb RA. Rigorous exercise training increases superoxide

dismutase activity in ventricular myocardium. American J Physiol, 1993, 265: 2094-98.
39. Burneiko RCM, Diniz YS, Galhardi GM, Rodrigues HG, Ebaid GMX, et al. Interaction of hypercaloric diet and physical exercise on lipid profile, oxidative stress and antioxidant defenses. Food Chem Toxicol, 2006, 7; p.1167-72.
40. Qiao D, Hou L, Liu X. Influence of intermittent anaerobic exercise on mouse physical endurance and antioxidant components. Br J Sports Med, 2006, 40:214–18.
41. Lima FD, Stamm DN, Della-Pace ID, Dobrachinsk F, Carvalho NR, Royes LFF, Soares FA, Rocha JB, Galleo JG, Bresciani G. Swimming training induces liver mitochondrial adaptations to oxidative stress in rats submitted to repeated exhaustive swimming bouts. PLoSOne, 2013, 8(2): e55668, p.1-9.
42. Laughlin MH, Simpson T, Sexton WL, Brown OR, Smith JK, Korthuis RJ. Skeletal muscle oxidative capacity, antioxidant enzymes, and exercise training. J Appl Physiol, 1990, 68: 2337-43.
43. Husain K. Interaction of exercise training and chronic NOS inhibition on blood pressure, heart rate, NO and antioxidants in plasma of rats. Pathophysiol, 2003, 10: 47-56.
44. Venditti P, Napolitano G, Barone D, Di Meo S. Effect of training and vitamin E administration on rat liver oxidative metabolism. Free Rad Res, 2013, 48: 322-32.
45. İnal M, Akyüz F, Turgut A, Getsfrid WM. Effect of aerobic and anaerobic metabolism on free radical generation swimmers. Med Sci Sports Exerc, 2001, 33: 564-67.
46. Husain K, Hazelrigg SR. Oxidative injury due to chronic nitric oxide synthase inhibition in rat: effect of regular exercise on the heart. Biochem Biophys Acta, 2002, 1587:75-82.
47. Hellsten Y, Svensson M, Sjödin B, Smith S, Christensen A, Richter EA, Bangsbo J. Allantoin formation and urate and glutathione exchange in human muscle during submaximal exercise. Free Radical Biol Med, 2001, 31: 1313-22.
48. Svensson MB, Ekblom B, Cotgreave IA, Norman B, Sjöberg B, Ekblom O, Sjödin B, Sjödin A. Adaptive stress response of glutathione and uric acid metabolism in man following controlled exercise and diet. Acta Physiol Scand, 2002, 176: 43-56.
49. Liu J, Yeo HC, Overvik-Douki E, Hagen T, Doniger SJ, Chyu DW, Brooks GA, Ames BN. Chronically and acutely exercised rats: biomarkers of oxidative stress and endogenous antioxidants. J Appl Physiol, 2000, 89: 21-8.
50. Kuyvenhoven JP, Meinders AE. Oxidative stress and diabetes mellitus: Pathogenesis of long-term complications. Eur J Intern Med, 1999,10: 9-19.
51. Adewole SO, Caxton-Martins EA, Ojewole JAO. Projective effect of quercetin on the morphology of pancreatic β-cells of streptozotocin-treated diabetic rats. Afr. J Trad, 2007, (1):64-74.
52. Biçer M. Effects of zinc supplementation on lipid peroxidation, and lactate levels in rats with streptozotocine-induced diabetic and acute swimming exercise, Phd Thesis, Gazi Unv Health Sci Ins, Physical Edu Sport, 2008, Ankara, 136; 24-25.
53. Villa-Caballero L, Nava-Ocampo AA, Frati-Munari A, Ponce-Monter H. Oxidative stress, acute and regular exercise: Are they really harmful in the diabetic patient?. Med Hypotheses, 2000, 55, 43-46.

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Social Paradigms Shaping Leisure Research Designs: A Systematic Review

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Social Paradigms Shaping Leisure Research Designs: A Systematic Review
Abstract

Researchers conduct their studies in accordance with their perspective and philosophy that they ground on. There are philosophical hypothesis and specific beliefs that guide them to define and understand the underlying reasons of a case. These philosophical hypotheses stand out in every stage of the research including conducting the theory, type and method of the research and reporting. The purpose of this study is to review leisure studies in Turkey systematically in the context of paradigms and enlighten historical process of paradigms in the research. Document analyses are used as data collection technique. In accordance with the purpose of this study, literature review is performed in three data bases by using 9 keywords in Turkish and English in total 134 articles are evaluated based on both abstract and full review. It is detected that historical process of leisure studies accompanied by quantitative researches, but qualitative and mix type researches taken place in literature after 2010. Functional Paradigm is dominated when research types are embraced, and survey researches performed more in the Functionalist Paradigm. Institutions providing recreation education are also recommended to support qualitative and mixed method research in order for current approaches in the field to be followed and qualified studies to be put forth.

Key Words: Social Paradigms; Leisure; Systematic Review

Serbest Zaman Çalışmalarına Yön Veren Sosyal Paradigmalar: Sistematik Bir İnceleme
Özet

Araştırmacılar temel aldıkları felsefe ve bakış açısına dayalı olarak çalışmalarını yürütürler. Onları bir olayın arka planını anlama ve onu açıklama çabasına yönlendiren belli inanışları ve felsefi varsayımları bulunmaktadır. Bu felsefi varsayımlar araştırmaya rehberlik eden teorilerin seçiminden, araştırmanın yöntemi hatta deseni ve raporlamasına kadar her aşamasında ön plana çıkmaktadır. Bu çalışmanın amacı; ise serbest zaman alanında yapılan çalışmaları paradigma bağlamında sistematik bir şekilde incelemek ve araştırmalarda yer alan paradigmaların tarihsel sürecine ışık tutumaktır. Bu çalışma sistematik inceleme olup çalışmada veri toplama yöntemi olarak doküman analizi kullanılmıştır. Çalışmanın amacı doğrultusunda, Türkçe ve İngilizce olarak 9 anahtar kelime kullanılarak alan yazın taraması yapılmıştır. Yapılan çalışmada toplam 134 makale özet ve tam metin olmak üzere değerlendirilmiştir. Nicel çalışmaların serbest zaman araştırmalarının tarihsel sürecine eşlik ettiği ancak nitel ve karma yöntem araştırmalarının 2010 yılı sonrası alanyazında görüldüğü tespit edilmiştir. Araştırma desenleri, paradigma bağlamında ele alındığında ise yapısalcı paradigmanın oldukça baskın olduğu, yapısalcı paradigma bağlamında en çok ölçek çalışmalarının yapıldığı saptanmıştır. Alandaki güncel yaklaşımların takip edilmesi ve nitelikli çalışmaların ortaya konulabilmesi için rekreasyon alanında eğitim veren kurumların nitel ve karma yöntem araştırmalarını da desteklemesi önerilmektedir.

Anahtar Sözcükler: Sosyal Paradigmalar; Serbest Zaman; Sistematik İnceleme

INTRODUCTION

Researchers carry out studies based on philosophies and perspectives they adopt. Researchers also have certain beliefs and philosophical assumptions that guide their efforts to understand and explain the background of an incident (5). These philosophical assumptions come to the forefront at every stage from the selection of guiding theories to the method and even the design and reporting of the research. They are an important component of the research; hence they should manifest themselves throughout the whole research. Because there is a strong correlation between the scientific philosophy and objective embraced by the researcher and the methodology of the research (9).

The research philosophy can be defined as the body of ideas and beliefs that shape the thoughts of the researcher. The ideas presented by the researchers before the onset of the research bear the traces of their philosophical thoughts and affect the entirety of the research. This philosophical thought guides a researcher's way of handling a problem and all the theories and data collection tools adopted by the researcher in an attempt to explain the problem in question (20). Paradigm, however, is related to the laws of nature and each paradigm seeks an answer for these laws. It presents different points of view of a researcher towards the same phenomenon (16). In other words, paradigm covers the nature of reality (ontology), the nature of knowledge (epistemology) and the analysis of methods (methodology) criteria (25). Therefore, the researchers should first question their own backgrounds, assess how they see themselves and others and they should be aware of the way they view political and ethnical matters, rather than focusing on the method they adopt before the beginning of the research (9).

Hence, this study has two different purposes. The first is to help researchers realize that it is important for them to better explore their own scientific beliefs (ontologically, epistemologically, methodologically & in terms of human nature), scientific interests and the research design they should adopt in parallel with their interest areas together with their overall worldview towards nature and other phenomena. The second is to carry out a systematic review of the studies conducted in the field of leisure based on these theoretical perspectives.

Literature Summary

Researchers should determine the accurate research method and research design their study suits. The starting point of their study is what they should pay attention the most, i.e. they should know the theoretical and philosophical background of their research topic. This is the only way for the researchers to be able to choose the most accurate research method and research design for the topic they want to study. It is assumed that such an approach will also facilitate the research process (20). At this point, the researcher's belief on the nature of reality (ontology) and the nature of knowledge (epistemology) has the utmost importance and it is deemed vital for determining the research methodology. In order to better understand the aforementioned notions, first of all the "subjective – objective dimension" model developed by Burrell & Morgan (4) for the analysis of the assumptions of the nature of social sciences will be assessed and then Habermas's theory of knowledge-constitutive (cognitive) interest will be handled in detail and ultimately four main paradigms that guide scientific researches will be tackled at large. Based on this theoretical construct, the model (Paradigms in Guiding Social Research Design) of Gunbayi & Sorm (13) will be reviewed and the research designs will be classified as per paradigms and reviewed systematically in the final phase of the research. This model is based on similar philosophical fundamentals with the studies that tackle paradigms as per research methods. However, different from these studies it classifies paradigms according to research designs and provides detailed information as to which research design should be under which paradigm.

Subjective- Objective Dimension

In 1979, Burrell & Morgan (4) came up with a scheme for analysing the assumptions about the nature of social science (Figure.1). This scheme is used as a fundamental tool for the classification of the four paradigms in social research. Burrell & Morgan (4) believed that all theories on organizations are shaped by social theories and the philosophy of science and they analysed different approaches of social sciences with existing philosophical assumptions (ontology, epistemology, human nature and methodology). According to Burrell & Morgan (4), the researchers embark upon

their research subjects with a focus on the assumptions on the nature of the social world. The first of these is the ontological assumption, which is the essence of the research subject. With ontological assumptions, one tries to answer the following question "Where is the reality?" is it within the individual (?) or somewhere outside (?). Ontological assumption is accompanied by epistemological assumption that questions the nature of knowledge. Epistemological nature is concerned with how the individuals perceive the world and how they communicate. Which knowledge is obtained by the individuals and can such knowledge be classified as "true" or "false" (?). In summary, epistemological nature questions whether knowledge is something to be acquired by everyone or something acquired through personal experiences. The third assumption is the human nature. Although human nature relates to ontological and epistemological nature, conceptually it differs from the two. This assumption studies the human nature and its relation with the environment around. In other words, it deals with this question; does human behaviour arise from the external world (?) or do people act upon their free wills (?). Ultimately, these first three assumptions affect the research methodology and the researchers form their research methods within the compass of the main assumptions they believe in. Hence, they will establish their research methodology based on universal laws if they believe that reality lays somewhere outside the individual; whereas they will work on a methodology to understand and interpret the present situation if they believe that social world is a subjective experience resulting from the individuals' experiences. Below are more details on the subjective–objective dimension of Burrell & Morgan (4).

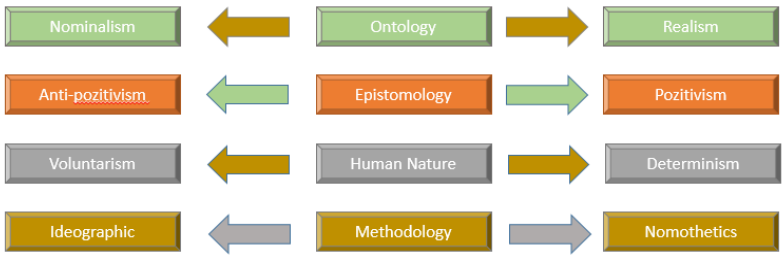

Figure 1. *A scheme for analysing assumptions about the nature of social science (4)*

Nominalism versus Realism

Nominalism is one the notions of ontological dilemma dealt by Burrell & Morgan (4) and it derives from the Latin "nomen" meaning name. This philosophy mainly arises from "Tahafut Al-Falasifah" the Arabic philosophy from A.D. 1059 to 1111 and the European Middle Age era (24). Nominalists refuse the real structure of the external world, which is described by certain concepts. According to them, names are artificial creations to describe, make sense of and negotiate the external world. In other words, nominalists believe that all the concepts and labels used for describing and structuring the social world external to individual cognition are nothing more than names. Such an effort is merely a tool used to make sense of the external world. Contrary to nominalism, the realists, on the other hand, believe that the outer world does not change relatively; it is comprised of hard, tangible and immutable structures. Such structures exist as empirical entities, whether we label and comprehend them, or not. According to the realists, social world sustains its existence independent of the perceptions of an individual. An individual is born into and lives through a social world that has its own reality. The individuals do not create such world; it already exists and precedes the existence and consciousness of the humankind from an ontological point of view. For the realists, the existence of the social world is as hard and tangible as of the natural world (4).

Positivism versus Anti-positivism

Epistemological dimension of Burrell & Morgan (4) contains positivist and anti-positivist concepts. Auguste Comte, who established a positivist approach to the social science, created positivism in the Mid-19th Century. Positivists believe that the explanations in the fields of sociology and natural science are the same because the positivist epistemology is based on the conventional approaches of the natural science. Therefore, they use the logic, methods and procedures of the natural

science in interpreting social phenomena (18). According to Mastin (19), the most reliable knowledge is the scientific knowledge and such knowledge arises from strict scientific methods, empirical evidences and provable theories. Five main principles lie at the bottom of positivism:

(1) The logic of the inquiry is the same for both social and natural sciences.

(2) The aim of the inquiry is to explore, explain and predict the appropriate and necessary conditions for the phenomena.

(3) The research should be empirically observable and testable by humans and should allow developing statements based on inductive logic.

(4) Science is not the same with common sense the researchers should be careful so that general perception does not guide their research.

(5) Science should be judged by logic and as free from value judgment as possible. The main purpose of science should be to generate knowledge irrespective of politics, morals, values etc.

Some sociologists that believe in anti-positivism claim that three goals of positivism (control, prediction and measurement) do not suffice as the goal of comprehension is missing (30). Anti-positivism is based on the belief that inter-subjective world is relativistic, and the social world can only be understood looking through the perspective of the individuals who directly participate in the studied actions. Therefore, they are inclined to refuse that science is capable of producing objective knowledge. Similarly, Lawson et al. (18) claim that the subject of sociology is different than the natural sciences' and scientific methods cannot explain social actions. According to anti-positivists, one needs an insider's perspective to understand something; hence, it is the subjective knowledge that matters, not the objective one. Noting that subjective consciousness of the individuals is unquantifiable, they refuse the idea of scientific knowledge that is characterized by the objectivity of the science.

Voluntarism vs Determinism

The nature of human gives birth to the following dilemma; do humans behave with their free will (?) or are such behaviours shaped by the social structures beyond one's free will (?). Determinism suggests that the views of a person are completely shaped by the social world one lives in, whereas voluntarism pleads that individuals are completely free willed to make their own decisions (4).

Ideographic versus Nomothetic

The methodological dilemma on the other side is between the idiographic and nomothetic approaches. Idiographic approach suggests that one should obtain knowledge at first hand so as to comprehend the social world. Therefore, one should investigate the notion or person in question, thoroughly. Idiographic approach rather concentrates on the subjective thoughts of the daily life; consequently, biographies, diaries, all the documents and archives of the social world are assessed one by one. Nomothetic approach, however, is contrary to the ideographic approach and adheres to the structure and scientific principles of natural science; therefore, its method is to test the developed hypotheses. Accordingly, it relies on quantitative research methodology and related techniques, such as scales and experiments.

Four above-mentioned assumptions are the most widely accepted and most frequently used instruments to analyse social researches, scientifically. Moreover, Habermas's theory of knowledge-constitutive interest reflects the epistemology of social scientific research and claims that the researcher's perception of the world is deterministic on the choice of the research method (Figure 2).

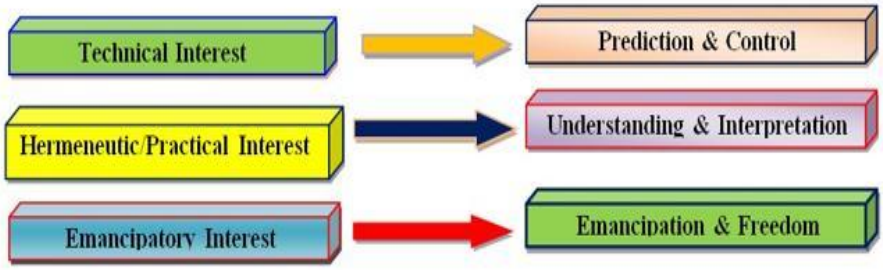

Figure 2. *Habermas's (15) knowledge constitutive (cognitive) interests*

Habermas' Theory of Knowledge-Constitutive (Cognitive) Interests can be seen on the epistemology of the social scientific research. According to Habermas, the technical interest is positivist and it focuses on laws and rules as well as predicting and controlling behaviours. Researchers with a technical interest try to access scientific knowledge by using measurement tools as part of research methodology. If researchers have technical interest, they should carry out their studies with tools (experimental, scale etc.) in radical structuralist, and functionalist paradigms. Hermeneutic interest, however, does not believe that reality is single or somewhere outside the individual like the practical interest. It believes that in order to fully understand a problem, one needs to be able to talk to the person who has gone through that problem, understand and interpret his/her feelings and ideas. Researchers with this view in mind should carry out interpretive paradigm-based studies (situation, phenomenology, ethnography etc.) (6). Finally, the researchers with emancipatory interest believe that people fall under the influence of superior actors and should gain awareness so as to free themselves from such influence. They note that realizing your own problems is the only way to solve them. Therefore, they think people should have awareness and be salvaged from learned helplessness. If the researchers have emancipatory interest, they should carry out their studies within the scope of radical humanist paradigm (critical discourse, emancipatory action research etc.) (2). Radical structuralist, functionalist, interpretive and radical humanist paradigms of the theory of Habermas (15) have been dealt by Burrell & Morgan (4). In their book "Social Paradigms and Organizational Analysis", mention four main paradigms that feature in the social science researches and reflect the social changes (Figure 3).

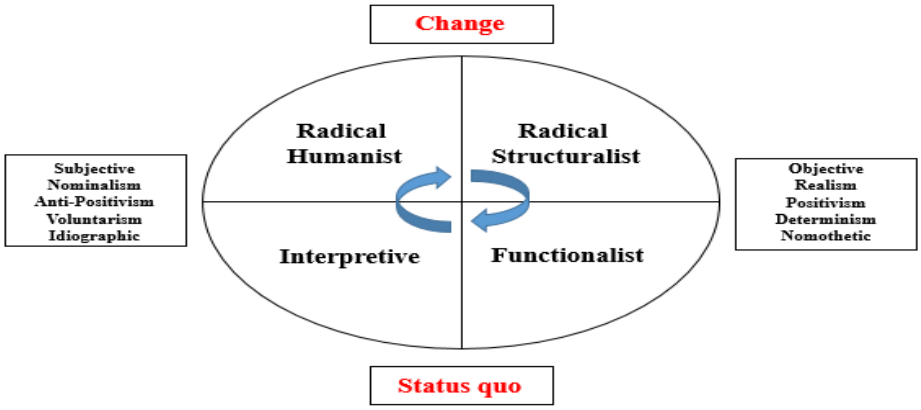

Figure 3. *Four paradigms for the analysis of social theory (4)*

Paradigms Guiding Qualitative Research

Radical Functionalist Paradigm

Max, Althusser, Poulantzas and Coiletti are the leading philosophers of radical functionalist paradigm. These philosophers state that human behaviour is influenced by the context-specific and dominant discourse and that economics and politics also play important role in shaping the human behaviour. In other words, they believe that social change can only be top-down and revolution-like, all at once (4).

Functionalist Paradigm

Functionalist paradigm, however, believes that a top-down revolutionary movement requires adaptation for sustainability and that such a movement should be controlled from the top in a balanced manner. Comte, Spencer, Durkheim and Pareto are considered to be the pioneers of the functionalist paradigm, with a dominant understanding of social engineering (4).

Interpretive Paradigm

Schultz, Kant, Hegel, Freud, Weber, Dilthey and Husserl are among the philosophers of interpretive paradigm and they claim that the social world can only be understood and explained from the viewpoints of individuals. Interpretive paradigm asserts that one of the most fundamental characteristics of the social life is the face-to-face interactions of the individuals, therefore one need to understand the individuals' descriptions of any given incident in order to really comprehend how social life works. According to the interpretive paradigm there are two fundamental approaches in

reflecting individual and interpersonal world. The first of these, the phenomenological symbolic interaction, claims that humans connect via the common meanings resulting from human interaction, whereas the ethnographic approach relies on the assumption that human actions are determinant in the creation of the social order and that every action has a meaning in its own context (4).

Radical Humanist Paradigm

Radical humanist paradigm claims that superior actors define human actions and therefore such actions are just some phenomena incarcerated in ideological acts. According to the radical humanist paradigm, people cannot engage in accurate actions, they experience alienation and have misleading consciousness due to the dominant discourse. Therefore, people need to free from the perception management of the superior's actors and act on their own free will so as to elude such guided behaviour (4). The researchers will have a more scientific approach to their studies, if they handle their research methods and designs under the light of above-mentioned information, know the ontological, epistemological and methodological backgrounds of their intended studies and if they are mindful about their scientific interests. In line with the aforementioned philosophical assumptions, Gunbayi & Sorm (13) produced a model that enables them to review research designs within the context of the paradigms they belong. This study that reviews the research designs within the context of the paradigms they belong is a first both for the national and international literature. Table 1 indicates the distribution of the research designs per paradigm.

Table 1. Research designs and their guiding paradigms

Paradigms	***Research Designs***
Radical Functionalist	*Technical action research*
	Experimental studies
	Quasi-experimental studies
	Mixed embedded design
Functionalist	*Surveys*
	Descriptive studies
	Relational studies
	Explanatory sequential design
	Convergent parallel design
	Multiphase mixed design
Interpretive	*Case study*
	Phenomenology
	Ethnographic studies
	Grounded theory
	Narrative analysis
	Discourse analysis
	Systematic review
	Meta-synthesis
	Convergent parallel design
	Exploratory sequential design
	Multiphase mixed design
Radical Humanist	*Participatory action research*
	Emancipatory action research
	Critical discourse analysis
	Transformative mixed design

This study aims to systematically review the research designs of leisure studies carried out in Turkey, within the context of paradigms, to identify the most frequently preferred research methods and research designs in line with the dominant paradigms, to determine the change of paradigms, which guide research designs, over the years and to review the research designs that contribute the most to the field again within the context of the dominant paradigms. This way, the study intends to reveal significant information in understanding the historical process of the leisure studies and determining the dominant paradigm in today's leisure field. Why leisure? "Leisure plays an essential role in individual, community and national development, contributing to the quality of life and well-being, the enhancement of social relationships and social capital and as a place of expression and engagement in democratic life" (31). To this end, the study tries to answer the following questions,

(1) What is the yearly distribution of the leisure articles published in the journals?

(2) What is the number of published articles according to the data collection techniques?

(3) What is the number of published articles according to the research methods?

(4) What is the yearly distribution of the data collection techniques?

(5) What is the research design distribution within the context of paradigms?

(6) What are the most contributing studies to the field within the context of paradigms?

MATERIAL & METHODS

This study is a systematic review and the preferred data collection method is document analysis. Systematic review is a research design where the research topic is chosen based on certain criteria and literature reviews, usually for either solving a problem or finding an answer to a question. In systematic reviews, inclusion and exclusion criteria are defined according to the studied problem and the research method and research findings of the included studies are synthesised (17). Therefore, in this study firstly the databases, on which the reviews to be conducted, were identified before the literature review was done. For the research sample, criterion-sampling technique, which is a purposive sampling technique, was adopted and complete inventory count was reached.

Literature review was conducted on the TUBITAK (The Scientific and Technological Research Council of Turkey) and ULAKBIM (Turkish Academic Network and Information Center) databases within the scope of DergiPark service and on TR Dizin (Turkish Index). There is no journal in Turkey that publishes only in the field of leisure and recreation. Therefore, during the literature review, the journals that publish articles in the leisure and recreation field under the sports science's category were identified and 9 key words (5 of Turkish and 4 of English); leisure, recreation, recreative, recreational were used both in English and Turkish during the review of aforementioned journals. For the study to be in parallel with its purpose the key words were broad in scope to cover all the studies in the field and no other inclusion or exclusion criteria were used. However, during the literature review it was realized that there were some articles in the reviewed databases that should be taken into consideration although they did not match with the key words. For instance, recreation is a classifiable concept according to time, location and purpose. A total of 150 abstracts and full articles were assessed. The classification that researchers conducted in the research findings resemble the systematic reviews they carried out previously (32).

Literature review by use of the key words resulted in 28 journals in TUBITAK and ULAKBIM databases, which fall under DergiPark and publish leisure studies, and 3 journals under TR Dizin. However, 7 of the journals under TUBITAK and ULAKBIM were excluded since they have not started publishing yet. In conclusion, a total of 150 articles were included; 129 articles from 18 journals under DergiPark and 21 articles from 3 journals under TR Dizin.

RESULTS

The transformation of leisure in Turkey over the years, the distribution of the published articles according to the data collection and research methods, the research designs and the yearly change of such designs will be dwelled upon descriptively, before passing on to the findings. Such information is considered to be vitally important in order to understand the progress of leisure in Turkey. After the descriptive statistics, research designs will be assessed within the scope of the paradigms, which is the main purpose of the study. Moreover, the articles that contribute the most to the field will also be touched upon within the context of paradigms.

Table 2. Number of articles according to years

Number of Articles According to Years	#	%
1996-2000	6	4.0
2001-2005	8	5.3
2006-2010	17	11.3
2011-2015	55	36.6
2016 and after	64	42.6
Total	150	100.0

Evaluating the leisure articles in Turkey in 5-year periods is essential to capture the evolution in the field of leisure. In this systematic review, each of the first four periods cover 5 years while the last period covers only 3 years. The articles in the last period were evaluated until the end of 2018. The findings revealed that the first study in the field of leisure was carried out in 1996 in Turkey and the ratio of leisure articles published between 1996 and 2000 was too low (4%) compared to other articles published in the same period. This ratio was still quite limited (5.3%) between 2001 and 2005, although it increased slightly. The number of leisure articles nearly doubled (11.3%) between 2006 and 2010 compared to the previous 5-year period but gained a substantial momentum especially in and after 2011 (36.6%). The last period also indicates an increase in the number of published articles compared to the previous period. Accordingly, number of articles published between 2016 and 2018 were higher (42.6%) than the previous 5-year period. It was observed that the number of articles increased systematically in the last 3 years and the highest number of publications was reached in 2018.

Table 3. Distribution of articles according to data collection methods

According to Data Collection Techniques	#	%
Empirical Studies	134	89.3
Non-Empirical Studies	16	10.6
Total	150	100.0

Researchers classify the studies in different ways according to data collection methods. However, in this study the classification of Büyüköztürk et al. (5) was adopted and according to data collection methods, the studies were classified into two categories; empirical methods (empirical and observational) and non-empirical (documentary) methods. A review of the studies conducted in Turkey reveals that the ratio of empirical studies is quite high (89.3%), whereas the ratio of non-empirical studies is lower (10.6%).

Table 4. Distribution of articles according to research methods

Research Methods	#	%
Empirical Studies		
Quantitative	113	75.3
Qualitative	16	10.6
Mixed	5	3.3
Non-Empirical Studies		
Literature Review	16	10.6
Total	150	100

In the classification according to research methods, the empirical and non-empirical studies were also further classified. The classification of Tashakkori & Teddlie (28) was chosen for the classification of empirical studies (22). Accordingly, empirical studies were classified into three categories; quantitative, qualitative and mixed methods. Evaluating the findings of this study within the context of empirical studies, one can say that the ratio of quantitative studies (75.3%) is distinctively higher compared to the qualitative (10.6%) and mixed method (3.3%) studies.

Another category in this classification is the non-empirical studies and this study covers the literature reviews and theoretical analyses. However, Table 4 does not indicate theoretical analyses since the findings of this study did not reveal any. Findings of this study asserted that literature review is the 2nd most preferred research method among all non-empirical studies (10.6%). Systematic reviews, in particular, are found to be preferred more and more among all literature reviews in recent years.

Table 5. Distribution of research designs used in the empirical studies

According to Research Designs	#	%
Quantitative		
Questionnaire-Based Review	98	73.1
Relational Review	13	9.7
Experimental Studies	2	1.4
Qualitative		
Case Study	11	8.2
Phenomenology	2	1.4
Systematic Review	3	2.2
Mixed		
Convergent parallel design	4	2.9
Exploratory mixed design	1	0.7
Total	134	100

The systematic analysis revealed that the most frequently used research method by the researchers is the quantitative study method. Classification of empirical studies according to the research designs indicated that descriptive – questionnaire-based reviews are the highest in number (73.1%), followed by descriptive–relational reviews (9.7%). The least preferred research design among the quantitative researches is the experimental studies (1.4%).

There are many classifications for qualitative researches in the literature. For example, Tesch (29) classifies qualitative research designs into four categories based on the interest of the researcher, while Crabtree & Miller classify qualitative research designs into eighteen categories based on areas related to human life with a focus on the social world and culture of the researcher. In this systematic analysis, the classification developed by Denzin & Lincoln for the qualitative research designs in social sciences was used as it was deemed appropriate for the nature of this study (9). According to this classification, qualitative research designs are the following; phenomenology, case study, grounded theory, ethnography, critical discourse, narrative, action research and systematic review. Among the qualitative research designs, however, no study was found on grounded theory, ethnographic studies, critical discourse analysis, narrative analysis and action research. The most frequently preferred qualitative research design is the case studies (8.2%) followed by systematic reviews (2.2%) and phenomenological studies (1.4%), respectively.

In this study, the mixed method researches were reviewed and segregated into six designs (The Convergent Parallel Design, The Explanatory Sequential Design, The Exploratory Sequential Design, The Embedded Design, The Multiphase Design, and The Transformative Design) according to the systematics of (23). A review on the aforementioned systematics revealed that the two of these six mixed method research designs come into prominence and among the two convergent parallel designs is the most preferred one (2.9%).

Table 6. Distribution of empirical and non-empirical studies according to years

	1996-2000		**2001-2005**		**2006-2010**		**2011 -2015**		**2016 & after**		**Total**	
	#	%	#	%	#	%	#	%	#	%	#	%
Quantitative	3	50.0	6	75.0	16	94.1	40	72.7	48	75.0	113	75.3
Qualitative	-	-	-	-	-	-	5	9.0	11	17.1	16	10.6
Mixed	-	-	-	-	-	-	3	5.4	2	3.1	5	3.3
Literature	3	50.0	2	25.0	1	5.8	7	12.7	3	4.6	16	10.6
Total	6	100.0	8	100.0	17	100.0	55	100.0	64	100.0	150	100

Table 6 aims to draw attention to the years when the qualitative and mixed method studies among other empirical studies started in Turkey, the distribution of them in years and their change compared to other studies. Because this creates the basis of the next finding and provides clues about the paradigm shift. The results indicate that the qualitative and mixed method studies were first used in Turkey after 2010. Literature includes a total of sixteen qualitative studies, five between 2011 and 2015 and eleven in and after 2016 while the number of mixed method studies is five in total, three between 2011 and 2015 and twelve in and after 2016. Although qualitative and mixed study methods first entered the literature after 2010, their number has been quite small compared to quantitative studies in the last 8 years. Lastly, we can say that literature reviews, although not many in number, have been conducted by researchers since 1996 until today.

The following findings focus on the research designs within the context of paradigms, which is the main interest of this study. The research methods (quantitative, qualitative and mixed method studies) give clues about the paradigms but the best way to interpret paradigms requires approaching them in the context of research designs. Because many studies, although they fall under the same category as per research methods, diverge in the context of paradigms (4). Therefore, paradigms were reviewed as per their research designs (Table 1), in view of the model of Gunbayi & Sorm (13). Findings of this study indicate that research designs divide into three main paradigms (radical functionalist, functionalist and interpretive paradigm). Radical humanist paradigm was excluded from the table considering there was no study in its context (Table 6).

Table 7. Distribution of research designs according to paradigms

Researches in the context of Paradigm	#	%
Radical Functionalist Paradigm		
Experimental design	2	1.3
Functionalist Paradigm		
Literature review	16	10.6
Relational review	13	8.6
Questionnaire-based review	98	65.3
Convergent parallel design	4	2.6
Interpretive paradigm		
Case study	11	7.3
Phenomenology	2	1.3
Systematic review	3	2.0
Exploratory sequential design	1	0.6
Total	150	100.0

Table 7 shows that experimental studies are among the least preferred research designs in the literature. In other words, radical functionalist paradigm is the least preferred paradigm when compared to others (1.3%).

Among the functionalist paradigm studies, questionnaire-based reviews are the most practiced type (65.3%). Literature reviews (10.6%) and relational reviews (8.6%) rank the second and the third, respectively, after the questionnaire-based reviews. It is safe to say that these three research designs are preferred the most by the researchers under the functionalist paradigm. To put it differently, these three research designs alone constitute 84.5% of all research designs. Convergent parallel design differs from the above-mentioned three designs in terms of research methodology but merge with them under the same paradigm category and it is the least preferred research design under functionalist paradigm. Although it is the least preferred research design under the functionalist paradigm, it is still preferred more compared to the research designs under other paradigms except for the case studies.

Looking at the distribution of research designs under interpretive paradigm, it appears that qualitative research method is the most frequently applied research design under this paradigm. Accordingly, case studies are studied the most (7.3%). Systematic review is the second most preferred research design (2.0%) among qualitative research designs followed by phenomenological studies (1.3%). Exploratory sequential design under interpretive paradigm differ from other designs in terms of research method and it is the least preferred mixed method research design under interpretive paradigm (0.6%).

Table 8. Articles that contribute the most to the field

Citation	Lead Author	Name and Publication Year of the Article	Citation Period
48	**Balcı, V.**	The determination student's participation levels to recreational activities in universities of turkey (2006)	2006-2016
29	**Ardahan, F.**	An examination of leisure satisfaction level of university students with regard to gender and income (2010)	2010-2016
24	**Tütüncü, O**	Analysis of factors affecting recreation participation of university students (2011)	2011-2018
22	**Karlı, U.**	Reliability and validity study of leisure satisfaction scale (LSS-Long version)	2008-2016
20	**Kurar, İ.**	People's leisure habits review: Case of Alanya (2014)	2015-2017

Table 8 indicates the articles contributing to the literature the most. The first column of the table shows the number of citations received by the articles, while the last column shows the citation period. This study reviewed the sixty-three studies that contribute to the literature the most and it was found that the top 5 most-cited studies were approached within the scope of the functionalist paradigm (survey).

DISCUSSION

It was deemed important to review the journals that publish in the field of leisure and recreation before discussing the findings of the study. The fact that there are journals publishing in a certain field regularly and that their numbers increase constantly can give meaningful clues about the development of that field. Looking at the previous systematic reviews conducted by researchers, it appears that they reviewed a total of 16 journals; 12 from TUBITAK and ULAKBIM, 4 from TR Dizin. The number of journals that publish under the same databases increased up to 21, although it has only been a year. This increase demonstrates that leisure is among the developing disciplines in Turkey and the number of journals and researchers that publish in the field of leisure is ever increasing. The research findings also support this statement.

It is observed that studies in the field of leisure have systematically increased in every five-year period since 1996. The number of articles published between 2001 and 2005 doubled between 2006 and 2010, while the number of articles between 2011 and 2015 tripled compared to the previous five-year long period. The findings demonstrate that the sharpest increase on the number of articles occurred after 2010. Even the number of articles from 2016 to 2018 was higher than the ones in the previous five-year long period. A look at the historical process of leisure in Turkey reminds that "The seventy Development Plan" was prepared for the period of 1996 and 2000, which included a resolution for attaching greater importance to more efficient use of leisure time of the individuals. The plan aimed to train educational personnel for efficient use of leisure and to meet the need for manpower to carry out recreation organizations (11). The seventy Development Plan also indicated that there was a need for opening recreation departments at the universities. Accordingly, Mugla University School of Physical Education and Sports started to teach recreation for the first time in 1998, upon the decision of the Inter-University Council (35). Similarly, "The eight Development Plan" from 2001 to 2005 also emphasized the importance of recreation training and asked for further actions to be taken for rendering recreation activities appealing by receiving the support of local authorities to accelerate such activities (10).

Additionally, The Council of Higher Education assigns the duty of providing necessary means and resources such as materials and facilities to universities, for the most efficient use of leisure time by the youth, as per Article 47 of the Higher Education Law (2547) (34). Thanks to all these efforts, the number of educational institutions that teach recreation increased in Turkey. A total of 183 universities including 112 state universities and 71 private foundation universities started to teach recreation (33). 36 of these universities teach recreation in undergraduate programs; 29 out of 36 teach recreation at the Schools of Physical Education and Sports, whereas the remaining 7 teach at the Tourism Faculties under recreation management departments. 4 universities in Turkey have post-graduate master's and doctorate programs (32). All this information explains why the number of studies conducted in the field of recreation has been increasing systematically since 1996.

Assessing the data collection techniques of the study, it appears that empirical studies are preferred much more than the non-empirical studies. This study uses the classification method of Büyüköztürk

et al. (5) and classifies the studies as empirical ones (empirical, observational) and non-empirical ones (documentary). It is known that recreation started to be mentioned as a concept in Turkey as of 1990s, however, it started as movement in Europe in the beginning of 1900s (12). In 1949, the concept of recreation was first used in scientific journals academically, in Europe (www.tandfonline.com) and its theoretical foundations were first laid in 1950s. This may be one of the reasons why recreational studies in Turkey fall behind Europe. For instance, the constraints theory, studied by Crawford & Godbey (7) for the first time, was brought to Turkey thirty years later by Gürbüz & Karaküçük (14). Even today, the Turkish adaptation process of the topics, theories and measurement tools that are studied and developed in Europe is still going on. Actually, such efforts mostly include the adaptation of the scales, which evidently give prominence to descriptive and relational studies on the population in question. This also explains why the quantitative studies among the empirical ones are higher in number compared to other type of studies (qualitative and mixed). Of course, there are some other deterministic factors behind the tendency towards quantitative studies, as well. One of them, for example, is the fact that leisure is a relatively new field in Turkey, which results in limited number of trained academicians. Accordingly, the researchers tend to adapt the psychometrically satisfying measurement tools developed in different cultures, rather than developing their own. From this perspective, it is more understandable why the empirical studies and the quantitative ones, in particular, draw more interest in Turkey. Another reason why the quantitative research methods among the empirical studies are more favoured is the existence of paradigms dominating the scientific researches. Paradigm shift and its repercussions in Turkey will be discussed at length under the section that dwells upon the yearly distribution of research methods.

Another finding of the study is the designs used in the empirical studies. In the previous finding, it was already mentioned that quantitative studies are the most frequently preferred research methods in the literature. Researchers also wonder what the most popular research design among the research methods is. Looking at the research data, it is noted that the two most frequently preferred research designs among the quantitative studies are the questionnaire-based reviews (73.1%) and relational reviews (9.7%), respectively. It was noted that experimental studies are the least preferred research designs by the researchers. It is safe to say that experimental studies are carried out to test the correlations among variables and as a research design they contain significant assumptions. When researchers wish to carry out an experimental study, they have to have random assignment of the experimental groups of the independent variable, manipulate the independent variable and control the dependent variables (3).

The study reveals that case studies are preferred the most among the qualitative studies and the convergent mixed design studies are more favoured among other mixed method studies. Another significant outcome regarding the limited number of qualitative and mixed method studies is that these studies entered the literature after 2010 and there was no study related to these researches before this date. Considering the findings of the study, there seems to be two main reasons behind. The first is, as explained above, recreation and leisure is a relatively new area in Turkey and therefore the researchers tend to carry out adaptations and descriptive studies. The second reason why the qualitative and mixed method studies show up in the literature after 2010 is the changes on the perspectives towards scientific studies. We can also say that the presence of qualitative and mixed method studies in the literature after 2010 give important clues about the paradigm shift. In other words, it is safe to say that the repercussions of the paradigm shift in Turkey started after 2010s; the anti-positivist and pragmatist perspectives started to grow, while the positivist perspective preserved its dominance.

Together with the recent developments in the philosophy of science, anti-positivist paradigm became more widespread as opposed to positivist paradigm and correspondingly the number of researchers that use qualitative research methods in their studies increase every passing day. Examining the historical process, the roots of qualitative research date back a long time in Europe, compared to Turkey. The number of qualitative researches increased in Europe from the end of 1970s to the beginning of 1980s, but it mainly presented itself in England with the paradigm shift of 1990s. The repercussions of this paradigm shift started to appear in Turkey as of 2010. It is believed that this delay also caused the qualitative and mixed method studies to enter Turkish literature late and affected

such studies both quantitatively and qualitatively. Besides, there is some criticism over the quantitative and qualitative studies in Turkey; they are found to be ontologically, epistemologically and methodologically challenged compared to other countries (20).

As for the mixed method studies, it is known that researchers have been carrying out such studies since 1989. Researchers have conducted many classifications regarding the mixed method studies in the literature. Following the two sociologists; Brewer and Hunter, Morse designed a system in 1991 on how to present both quantitative and qualitative studies together (1). Together with the contributions of Tashakkori & Teddlie (28), the framework of the design of the mixed method became clear and as of the beginning of 2000s, the use of mixed method increased gradually with its distinctive research design (8). Therefore, it is understandable that mixed method studies were accepted in Turkey and used ontologically, epistemologically and methodologically as of 2010, just like the qualitative methods. Additionally, the findings are also in parallel with the results of the systematic reviews conducted by previous researchers. A systematic review of the research methods of the journals until July 2017 revealed that the numbers of quantitative studies are much more higher compared to the qualitative and mixed method studies and the qualitative and mixed method studies demonstrate themselves in the literature as of 2010 in parallel with the findings of this study (31). Another attention-grabbing finding of this study is that quantitative studies, although they are still dominantly present among other research methods, have been on the decline (12.8%) in the last 1,5 years, whereas qualitative studies have increased by 2.3% in the meantime (31). Accordingly, it would not be wrong to say that anti-positivist perspective has gradually gained importance in the field of recreation and leisure.

Research methods (quantitative, qualitative and mixed method studies) give hints about the paradigms; however, the best approach to the paradigms is from the research design angle. This is because many studies differ from each another in the context of paradigms, although they may fall under the same research method category (4). For instance, quantitative studies, whether they have a positivist, realist, determinist or nomothetic perspective, differ in terms of paradigms according to their sub-designs. Therefore, experimental studies fall within the scope of radical functionalist paradigm, while surveys and descriptive studies fall under the functionalist paradigm. Similarly, qualitative research designs (case studies, ethnographic studies, grounded theories, phenomenological studies, narrative analyses, systematic reviews, action researches and discourse analyses) differ in terms of paradigms according to the model of Burrell & Morgan (4), although they are all positivist, nominalist, voluntarist and ideographic. It can be noted that some research designs such as action research and critical discourse analysis fall within the scope of radical humanist paradigm, whereas others are under interpretive paradigm.

The research method prioritized and concentrated on by the researcher determines the paradigm under which the mixed method study designs fall. For example, convergent parallel design gives weight to the quantitative and qualitative research methods equally but the explanatory sequential design mostly focus on the quantitative research methods and carries out the qualitative research, which constitutes the second phase of the study, based on the results of the quantitative research. Exploratory sequential design, however, is another mixed method research and it first collects qualitative data, contrary to explanatory sequential design. Qualitative phase is more prominent under this research design and the quantitative data is gathered only after the qualitative research results are obtained (8, 21). Many researchers develop measurement tools based on the information they gather from qualitative data with this design. Therefore, another name of this research design in the literature is the instrument development design (8, 21). As one can see, researchers feature research designs according to their viewpoints and the philosophies they believe in and they choose to use the remaining research method to support the data they have in hand.

In the light of this information, mixed method research designs also divide into four main paradigm categories and mixed embedded design studies fall under radical functionalist paradigm, whereas transformative mixed design falls under the radical humanist paradigm. Explanatory sequential design, on the other hand, falls under the functionalist paradigm and exploratory sequential design falls under the interpretive paradigm. The density and priority of the research method determine the exact paradigm (functionalist

paradigm and interpretive paradigm) under which the mixed method studies, also known as sequential designs, fall (13).

Based on aforementioned information, research designs were found to depend on three fundamental paradigms. The first is the experimental studies under quantitative research methods. Experimental studies are considered to be under the radical functionalist paradigm, and they are the least preferred research design by the researchers. This systematic review revealed that researchers concentrate the most on the studies that fall under the functionalist paradigm and the most studied research design under the functionalist paradigm is the questionnaire-based reviews (65.3%) followed by literature reviews (10.6%) and relational reviews (8.6%), respectively. Convergent parallel design also falls under the functionalist paradigm like others, but it is the least preferred research design (2.6%) by the researchers despite also being a mixed method. Another notable finding of this study is that one can find studies conducted on the four out of six designs under the functionalist paradigm but there is no study conducted on the explanatory or multiphase mixed designs among the mixed method designs.

Interpretive paradigm is another paradigm that research designs fall under. There are many research designs under the interpretive paradigm (ethnography, grounded theory, narrative, discourse analysis, meta-synthesis, and multiphase mixed design), however, the examples found in this study are case study, phenomenology and systematic review among the qualitative research designs and exploratory sequential design among the mixed method studies. The most preferred one among all these research designs though is the case studies (7.3%).

Finally, the articles that contributed the most to the field have been analysed and the top ten most-contributing articles were found to adopt the research designs that fall under the functionalist paradigm. Looking at the number of studies falling under the functionalist paradigm, it is understandable that the resources cited by these studies are also the studies under the same paradigm.

CONCLUSION

A review on the literature revealed that the number of systematic reviews on the field of leisure is limited. This systematic review on leisure, which is a fairly new study area in Turkey, is the first study that reviews the research designs based on their philosophical viewpoints. Therefore, it is believed to contribute to the literature, significantly. Philosophical backgrounds were taken into consideration, while analysing the studies together with an ontological, epistemological and methodological approach and a classification was adopted so as to prevent confusion. This systematic review not only sheds a light to the historical process behind the leisure field but also reveals the transformations in this process. The study demonstrates that the researchers' perspectives on the nature of reality (ontologically) and knowledge (epistemologically) have gone through changes within the historical process. It is believed that such realization will also give clues about the future trends of the researchers along with their viewpoints. For example, if it is more and more believed that human interactions are more influential in shaping the human behaviours rather than the dominant discourse, economy and politics, then the studied topic and contexts will also change. An interpretation of the future trends of study topics by the experts include cyber-kinetic society, physical activity, performance arts, feminism and its policies, the perception of welfare and happiness, migration and politics, emancipatory women politics and netnography (26, 27). The increase of the number of ethnographic and netrographic studies that tackle cultural issues in depth is understandable since the change on the perspectives towards knowledge and reality guides researchers into more specific topics. In Turkey, qualitative and mixed method studies should be supported and the number of educational facilities that teach recreation along with the number of qualified faculty members should be increased in order to be able to follow the recent approaches in the field of recreation, which is a relatively new area in our country, and to have sufficient studies that uncover the nature of existing studies in the field. Additionally, it is important to establish supervisory units for qualitative and mixed method studies on top of the existing quantitative research units under universities. Here it is vital to underline the significance of the knowledge regarding the philosophy that the research methods base on, so as to make such methods even more qualified. The philosophy of research should be regarded as a significant factor shaping all phases of a research from method to reporting. Therefore, the interest of the researchers on the philosophy of science should be enhanced for obtaining the most accurate

research methodology and reporting.

RECOMMENDATIONS

This study is limited to studies in the national database (DergiPark). Therefore, results assess the impact of the paradigm shift on the leisure studies only within the context of Turkey. Future studies can concentrate on international journals of the field to reflect the impact of the paradigm shift on other countries and to have a comparative analysis of international and Turkish studies.

REFERENCES

1. Baki A, Gökçek T. Karma yöntem araştırmalarına genel bir bakış. Elektronik Sosyal Bilimler Dergisi, 2012; 11(42), 1-21.
2. Bali RK, Wickramasinghe N, Lehaney B. Knowledge Management Primer. Routledge: Taylor & Francis Group, 2009.
3. Borg WR, Gall MD, Gall JP. Educational Research: An Introduction. 8th ed. Newyork: Longman Inc., 2006.
4. Burrell G, Morgan G. Sociological Paradigms and Organizational Analysis: Elements of the Sociology of Corporate Life. London: Routledge, 1979.
5. Büyüköztürk S, Çakmak K, Akgün OE, Karadeniz S, Demirel F. Bilimsel Araştırma Yöntemleri. Ankara: Pegem Akademi, 2014.
6. Cooper JA. Routledge Encyclopaedia of Educational Thinkers. Routledge: Taylor & Francis, 2016.
7. Crawford DW, Godbey G. Reconceptualizing barriers to family leisure. Leisure Sci, 1987; 9, 119-127. doi: 10.1080/01490408709512151.
8. Creswell JW, Fetters MD, Ivankova NV. Designing a mixed methods study in primary care. Ann Fam Med, 2004; 2(1), 7-12.
9. Creswell JW. Nitel Araştırma Yöntemleri. Bütün M, Demir SB, translator. Ankara: Siyasal Kitabevi, 2013.
10. Devlet Planlama Teşkilatı. Sekizinci Beş Yıllık Kalkınma Planı (2001- 2005). Ankara: 2020. Available from: https://www.sbb.gov.tr/wp-content/uploads/2018/11/Sekizinci-Be%C5%9F-Y%C4%B1l%C4%B1k-Kalk%C4%B1nma-Plan%C4%B1-2001-2005.pdf.
11. Devlet Planlama Teşkilatı. Yedinci Beş Yıllık Kalkınma Planı (1996- 2000). Ankara: 2020. Available from: https://www.sbb.gov.tr/wp-content/uploads/2018/11/Yedinci-Be%C5%9F-Y%C4%B1l%C4%B1k-Kalk%C4%B1nma-Plan%C4%B1-1996-2000%E2%80%8B.pdf.
12. Godbey GC, Caldwell LL, Floyd M, Payne LL. Contributions of leisure studies and recreation and park management research to the active living agenda. Am J Prev Med, 2005; 28(2), 150-158. doi: 10.1016/j.amepre.2004.10.027.
13. Gunbayi İ, Sorm S. Social paradigms in guiding social research design: The functional, interpretive, radical humanist and radical structural paradigms. International Journal on New Trends in Education and their Implications, 2018; 9(2), 57-76.
14. Gürbüz B, Karaküçük S. (2007). Boş zaman engelleri ölçeği-28: Ölçek geliştirme, geçerlik ve güvenirlik çalışması. Gazi Beden Eğitimi ve Spor Bilimleri Dergisi, 2007; 12(1), 3-10.
15. Habermas J. Knowledge and Human Interests: A General Perspective in Knowledge and Human Interests. Cambridge: Policy, 1987.
16. Jackson N, Carter P. In defence of paradigm incommensurability. Organ Stud, 1991; 12(1), 109-127.
17. Karaçam Z. Sistematik derleme metodolojisi: Sistematik derleme hazırlamak için bir rehber. Dokuz Eylül Üniversitesi Hemşirelik Fakültesi Elektronik Dergisi, 2013; 6(1), 26-33.
18. Lawson T, Jones M, Moore R. Advanced Sociology through Diagrams. UK: Oxford University Press. 2000.
19. Mastin L. The basic of philosophy, [updated 2020 February 15; cited 2008]. Available from: http://www.lukemastin.com/philosophy/branch_positivism.html.
20. Merriam SB. Nitel Araştırma. Turan S. translator. Ankara: Nobel Yayıncılık, 2013.
21. Morgan D. 1998 Practical strategies for combining qualitative and quantitative methods: Applications to health research. Qual Health Res, 1998; 8, 362-376. doi: 10.1177/104973239800800307.
22. Murphy J, Vriesenga M, Storey V. Educational administration quarterly, 1979-2003: An analysis of types of work, methods of investigation, and influences. Educ Admin Quart, 2007; 43(5), 612-628. doi: 10.1177/0013161X07307796.
23. Onwuegbuzie AJ, Leech NL. Enhancing the interpretation of significant findings: The role of mixed methods research. The Qualitative Report, 2004; 9(4), 770-792. doi:10.46743/2160-3715/ 2004.1913.
24. Pablo IA. Dictionary of World Philosophy. London: Routledge, 2001.
25. Patton MQ. Qualitative Evaluation and Research Methods. 3rd ed. Thousand Oaks, CA: Sage Publications, 2002.
26. Silk M, Caudwell J, Gibson H. Views on leisure studies: Pasts, presents & future possibilities? Leisure Stud, 2017; 36(2), 153-162. doi:10.1080/02614367.2017.1290130.
27. Spracklen K. The future of work and leisure. Annals of Leisure Research. 2007; 20(3), 394-396. doi: 10.1080/11745398.2017.1317462.
28. Tashakkori A, Teddlie C. Handbook of Mixed Methods in Social & Behavioral Research. Thousand Oaks, CA: Sage Publications, 2003.
29. Tesch R. Qualitative Research: Analysis Types and Software Tolls. Bristol: PA: Falmer Press, 1990.
30. Trueman CR. Anti-positivism, [updated 2020 April 23; cited 2015]. https://www.historylearningsite.co.uk/sociology/research-methods-in-sociology/anti-positivism/.
31. World Leisure Organization, 2021, Available from: https://www.worldleisure.org/about-us/.
32. Yerlisu Lapa T, Köse E. Günbayı I. Türkiye'de yapılan rekreasyon araştırmaları: Sistematik bir derleme. Spor Bilimleri Dergisi, 2018; 29(2), 87-104.
33. Yükseköğretim Kurumu. Üniversiteler. Ankara; 2020. Available from: https://www.yok.gov.tr/universiteler/universitelerimiz.
34. Yükseköğretim Kurumu. Yükseköğretim Kanunu (2547). Ankara; 2020. Available from: https://www.mevzuat.gov.tr/MevzuatMetin/1.5.2547.pdf.
35. Zorba E. Türkiye'de rekreasyona bakış açısı ve gelişimi. Gazi Haber Dergisi, 2008; 52-55.

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The Anger Expression Styles of the Students in the Faculties that Admit Students With Special Talent Exam

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Abstract

This study aims to analyze the relation of anger expression style of the students in the faculties that admit students with the special talent exam. The sample of the study consists of 523 volunteer students. 361 of them are male and 162 are female students studying at Selçuk University. The data of the study are analyzed using the t-test, ANOVA, and Tukey tests, and the personal information form is obtained using the constant anger and anger style scale. According to the findings of the study, the introvert anger dimension value of the students studying at the Faculty of Sport Sciences was found to be statistically higher than the students of the Faculty of Fine Arts. Moreover, it was determined that in the constant anger and extrovert anger dimension the value of men was higher than that of women. Finally, it was observed that as the ages and the grade of the students participating in the study grow their introverted anger and controlled anger values increased as well.

Key Words: Anger, Anger Expression Style, University Students

Özet

Çalışmanın amacı, özel yetenek sınavı ile öğrenci alan fakülte öğrencilerinin öfke ifade tarzları arasındaki ilişkisinin incelenmesidir. Çalışmanın örneklemini Selçuk Üniversitesinde öğrenim gören 361'i erkek ve 162'si kadın olmak üzere toplam 523 gönüllü öğrenci oluşturmuştur. Araştırmanın verileri, t-testi, ANOVA testi ve tukey testi kullanılarak çözümlenmiş ve kişisel bilgi formu sürekli öfke ve öfke tarzı ölçeği kullanılarak elde edilmiştir. Araştırma bulgularına göre, Spor Bilimleri Fakültesinde okuyan öğrencilerin içe dönük öfke boyut değerleri, Güzel Sanatlar fakültesi öğrencilerine göre istatistiksel anlamda yüksek bulunmuştur. Ayrıca sürekli öfke ve dışa dönük öfke boyutlarında, erkeklere ait değerin kadınlara göre fazla olduğu tespit edilmiştir. Araştırmaya katılan öğrencilerin yaşları arttıkça içe dönük öfkelerinin arttığı ve sınıfları büyüdükçe kontrollü öfke değerlerinin artışı gözlemlenmiştir.

Anahtar Kelimeler: Öfke, Öfke İfade Tarzı, Üniversite Öğrencileri

INTRODUCTION

Anger is one of the basic human emotions felt by everyone. It is also one of the most intriguing and least understood emotions (18). According to Seyyar (21), anger is the expression of emotional movements and fluctuations that can be noticed or not in the outside world, which manifests itself in different degrees.

Anger is defined as a message which conveys our emotions when we are hurt, our rights are violated and our wishes and needs are prevented (17). Anger has two main sources. These are our present and previous lives. Aggression and anger do not have to happen at the same time (19). Anger is an emotion that can be encountered during an event that will prevent people from doing things they enjoy and prevent their happiness (9).

Some people accept anger relief as an event that hurts and harms other people. However, revealing the emotion can trigger aggression even more. At this point, the right thing is to determine what the source of the current situation is and to develop different solution types for it (15). The purpose of controlling anger is not to suppress it, but to reflect it to the outside world in a healthy way. Since suppressing negative emotions that trigger anger causes personality problems (28).

Anger is expressed in different ways in our daily lives. The first one is the verbal expression of anger (30). Generally, individuals who encounter negativities express their anger by uttering unpleasant words towards the environment and displaying verbal or physically aggressive behaviors. People in such situations can express aggressive altitudes such as slamming doors, smashing things around them, tending to fight, and blaming others (8).

When the feeling of anger is not expressed correctly it gives rise to certain negative aspects. Some of these problems can be listed as divorce between spouses, interpersonal conflicts, virtual or verbal attacks, damaging the environment, inefficiency at work, and deterioration in mental health. While anger is suppressed, vague and abusive expressions could push someone to feel guilty. Moreover, when someone experiences a burst of anger comes up with overeating that may lead him/her to unhealthy calorie intake problems (3). Anger has a significant role in spending life thus besides the damages that anger may generate because of its functionality, it should be managed in a good way (27).

Someone's way of thinking when in anger indicates that he/she perceives events differently and more exaggerated than they are. It is very important to be aware of this situation and to replace these thoughts with more rational thoughts. When facing with anger, adopting reason and logic will protect oneself from the negative effects of anger (24).

Looking at the events that positively increase the anger will enable the individual to be more controlled (12). Engaging people with social activities is also very useful in anger management. Occupations like keeping the mind busy, being away from negative thoughts, and keeping individuals away from anger stimuli are among the benefits mentioned above. Regular exercise can be an effective solution for an individual who often experiences intense anger (26).

MATERIAL

Research model

In order to evaluate the results of the findings obtained in the research, a descriptive (survey) method is used.

In this respect, first of all, the descriptive survey model that is a research method that describes a specific situation and follows a certain chronological process will be applied. The situation is evaluated under the framework of formation condition and transferred as it is. The situation of the subject, object, and event cannot be changed and evaluated differently from its current state (11).

This study evaluates the constant anger and sub-dimensions of anger expression style of students who were successful in the special talent exam in the light of statistical data, taking into consideration their department, gender, grade, age, number of siblings, and the education level of parents.

Participants

The research was carried out with the participation of 523 volunteer students in total, 96 of whom were studying at the Dilek Sabancı State Conservatory, 112 studying at the Faculty of Fine Arts, and 255 studying at the Faculty of Sport Sciences in the 2015-2016 academic year of Selçuk University.

Personal Information Form

Questions developed by the researcher are established in order to determine the individual characteristics of the participant students regarding the research topic and to specify the independent variables of the study content.

Constant Anger and Anger Style Scale (CAASS)

This scale was put forward in the early 1980s C.D. by Spielberger which has 34 items. These 34 items have different distinctions within themselves (20). This scale was first used in our country in 1994 by being translated into Turkish. Unlike the original version, the part related to the state anger subtest was not translated. As a result of translating the other 44 items into Turkish, the 34-question form was developed and used in the study. In this developed Turkish form, four different factors appear as constant anger, introverted anger, extroverted anger, and anger control subtests. The part of the scale used up to the tenth question is related to the constant anger subtest. The following questions 13, 15, 16, 20, 23, 26, 27, and 31 test the introvert anger subtest, questions 12, 17, 19, 22, 24, 29, 32, and 33 test the extrovert anger subtest and show the tendency to aggression. Finally, the questions in the numbers 11, 14, 18, 21, 25, 28, 30, and 34 aim to determine the frequency of anger control (23).

In answering the questions in the scale, it is requested to choose one of the options as follows 'never', 'a little', 'quite a bit, and 'completely' regarding how much they describe the individual. Scoring is achieved by giving 1 point for the 'never' answer, 2 points for the 'a little' answer, 3 points for the 'quite a bit' answer, and 4 points for the 'completely' answer.

Obtaining more points from the scale questions aiming to detect constant anger indicates that the anger level is high. Obtaining more points from the answers in the section on controllable anger also indicates that anger can be kept under control. Evaluation of the answers given to the related questions in the determination of extroverted anger shows how easily it can be expressed. However, the data in the scoring of the suppressed anger, which is the last part of the scale, is important in determining whether the anger is suppressed or not.

To test the internal consistency of the test, total item correlations were found between .14 and .56, and Cronbach Alpha values were between .73 and .84 (20). The scale is developed in a four-point Likert type, and Cronbach Alpha values obtained from all group data were calculated separately in the reliability studies of the test. These are found as .79 for the Constant anger dimension; .84 for the "Controlled anger" dimension; .78 for the "Extroverted Anger" dimension and .63 for the "Suppressed Anger" dimension (23).

Analysis of Data

At this stage of the study, the frequency and percentage distributions of the individual characteristics related to this were determined in line with the data obtained from the university students constituting the sample group. SPSS (Statistical Package For Social Scientists for Windows Release16.0) program was used to provide statistical analysis of the data. The significance level was evaluated over 0.05. The statistical findings obtained were presented systematically in the form of a table in line with the purpose of the study. Whether the anger sub-dimensions showed a significant difference according to the socio-demographic characteristics of the students was examined with appropriate tests. First of all mean values are calculated for anger sub-dimensions. Afterward, assumptions (normality and homogeneity of variances) were tested and appropriate tests (t-Test, One-Way Anova Test, Kruskal Wallis Test, Post-Hoc LSD) were performed for independent groups and relations were measured.

RESULTS

Comparison of the Test Scores of Constant Anger, Anger Control, Extroverted Anger, and Introverted Anger Retained Sub-Dimensions According to Socio-Demographic Variables

Table 1. Comparison of the anger sub-dimensions of the students participating in the study according to their faculties

School Type	n	%	Constant Anger		Controlled Anger		Extroverted Anger		Introverted Anger	
			x	Ss	x	Ss	x	Ss	x	Ss
Conservatoire	96	18,4	23,15	5,58	21,18	5,14	16,75	4,44	15,70	4,10
Faculty of Fine Arts	172	32,9	22,44	6,06	21,87	5,20	16,60	4,52	15,73	4,29a
Faculty of Sport Sciences	255	48,8	22,50	5,96	21,54	5,11	16,91	4,54	16,71	3,93b
Total	523	100	22,60	5,92	21,58	5,14	16,78	4,51	16,20	4,10
P				,602		,567		,794		,023*

a, b, c, Significant difference between groups.

According to table 1, while there were not found any significant difference in the constant anger, controlled anger, and extroverted anger sub-dimensions of students participating in the study according to the faculties they studied, on the other hand, the average of introverted anger sub-dimension of students of the Faculty of Sport Sciences (16,71 ±3,93) was higher than of the students of the Faculty of Fine Arts (15,73 ±4,29) and this change was found to be statically significant (P<0,05).

Table 2. Comparison of anger sub-dimensions according to the gender of the students participating in the research

Gender	n	%	Constant Anger		Controlled Anger		Extrovertef Anger		Introverted Anger	
			x	Ss	x	Ss			x	Ss
Male	361	69,0	23,05	5,91	21,61	5,07	17,04	4,55	16,39	4,13
Female	162	31,0	21,59	5,84	21,52	5,32	16,20	4,37	15,79	4,02
		P		,009*		,87		,045*		0,12

*Significant difference between groups

When considering Table.2, no significant difference was found in the sub-dimensions of controlled anger and introvert anger according to the gender of the students participating in the research, while the averages of male students in the continuous sub-dimension (23.05 ±5.91) were higher than the averages of female students (21.59 ± 5.84).) In addition, in the sub-dimension of extrovert anger, the average of male students (17.04 ± 4.55) was higher than the average of female students (16.20 ±4.37).

Table 3. Comparison of anger sub-dimensions according to the grades of the students participating in the research

Grade	n	%	Constant Anger		Controlled Anger		Extroverted Anger		Introverted Anger	
			x	Ss	x	Ss	x	Ss	x	Ss
First grade	135	25,8	22,44	5,92	21,30	5,33	16,45	4,33	15,84	4,00 b
Second-grade	155	29,6	22,43	5,91	20,86	5,27a	16,96	4,98	15,97	4,20 c
Third-grade	139	26,6	21,96	5,81	22,47	5,06b	16,30	3,94	15,76	3,99
Fourth-grade	94	18,0	24,04	5,97	21,86	4,59	17,65	4,65	17,77	3,93a
Total	523	100,0	22,60	5,92	21,58	5,14	16,78	4,51	16,20	4,10
	P			,06		,049		0,11		,001*

* a, b, c, Significant difference between groups

Table 3 presents the statistical analysis of the differences between the students' grades and their anger expression styles. According to this table, no significant difference was found between the grades of the students participating in the study and the sub-dimensions of constant anger, controlled anger, and extrovert anger (P>0.05). However, a significant difference was found between 4th-grade students and 2nd and 1st-grade students in the introvert anger sub-dimension (P<0.05).

Table 4. Comparison of anger sub-dimensions according to the ages of the students participating in the research

Age	**n**	**%**	**Constant Anger**		**Controlled Anger**		**Extrovert Anger**		**Introvert Anger**	
			x	Ss	x	Ss	x	Ss	x	Ss
18-22	186	35,6	22,52	6,17	21,27	5,13	16,30	4,42	15,69	4,04a
23-27	273	52,2	22,52	5,85	21,79	5,21	16,84	4,60	16,34	4,13
28-32	64	12,2	23,19	5,51	21,58	4,87	17,92	4,24	17,09	4,04b
Total	523	100,0	22,60	5,92	21,58	5,14	16,78	4,51	16,21	4,10
		P		,698		,572		,064		,044 *

* a, b, c, Significant difference between groups

Table 4 contains statistical analysis between the anger expression styles of the students participating in the study and their ages. According to this table, no significant difference was found in constant anger, controlled anger, and extrovert anger styles, which are sub-dimensions of anger expression style (P>0.05). In terms of introvert anger expression, a statistically significant difference was found between the average of the students aged 28-32 (17.09 ±4.04) and the average of the students aged 18-22 (15.69 ±4.04) (P< 0.05).

DISCUSSION

In this section, with making comments on the findings of the study evaluations will be made in terms of founding the similarities and differences between the literature reviews and the results of the study.

While no significant difference was found in the anger expression styles of university students participating in the study in the sub-dimensions of controlled anger and introverted anger ($p>0.05$), a significant difference was found in the sub-dimensions of constant anger and extroverted anger ($p<0.05$).

In the statistical analysis, male students who participated in the research had higher constant anger and extroverted anger values than females. In the research conducted by Sezan (22) on the anger expression styles of university students who do exercise, no significant difference was found between different genders. It can be said that the difference between our research and Sezan's research is due to the sports habits of the university students participating in the research. In the study of Kuruoğlu (16), it was determined that there was a significant difference in anger expression styles according to genders.

The researcher determined that the style of expressing extroverted anger was higher in men than in women. On the other hand, Bostancı et al. (4), in their study with university students found that male students' aggression levels, which is called extrovert anger expression style, are higher than females. Again, as a result of Buntanie and Costenbader's (5) study, they determined that men show more signs of physical violence when they are angry. Tambağ and Öz (25) and Yarcheski et al. (31) concluded that the aggression scores of men are higher than that of women. Altuntaş (2) found in his study that male adolescents have higher averages for constant anger expression styles and introverted anger expression styles than female adolescent individuals.

In our study, however, no significant difference was found in introverted anger styles according to the gender variable. It can be said that this difference is due to the age range of individuals participating in the research. According to these results, which support our research to a large extent, it can be concluded that men's constant anger and extroverted anger expression styles, in other words, their aggression levels, are higher than women's. According to the grade variable of the university students who participated in the research, there was no significant difference in terms of constant anger, anger control, and extroverted anger styles ($p>0.05$), while there was a significant difference in terms of introverted anger style ($p<0.05$). There was a significant difference between the fourth-grade students and the first and second-grade students in terms of introvert anger style ($p<0.05$). While Sezan (22) found a significant difference between university students' grades and the sub-dimension of anger expression style, no significant difference was found in the expression styles of constant anger, controlled anger, and extroverted anger. The same researcher concluded that first-grade students are more introverted in expressing their anger than second- and fourth-year students. The results of our research show parallelism with the introverted anger expression style found by the researcher. However, in our study, it was concluded that as the grades of the participants' increase, there is a significant increase in their introverted anger expression styles. It can be said that the difference between the above research and our research is due to the selected sample group.

According to these results, it can be said that the students of the first and second grade who are at the beginning of their university education life face the difficulty of adapting to a new environment, the inability to express themselves comfortably and the inability to sense the reactions of their environment to them can cause an increase in their introverted anger.

In addition to this, it can be thought that senior students who will start his/her independent life have acquired the behavior or the ability to suppress their anger in comparison to other students. While no significant difference was found between the age variables of the university students who participated in the study and the sub-dimensions of anger expression, constant anger expression, controlled anger, and extroverted anger expression ($p>0.05$), there is a statistically significant difference in introverted anger expression style ($p<0.05$). In a study by Kaya et al. (13), it was observed that as the age of the student increased, the anger scores under control decreased.

Elkin and Karadağlı (7) did not find a statistically significant relationship between the age of the students and the constant anger sub-

dimension in their study titled University Students' Anger Expression Style and Related Factors in 2015. In a study conducted by Yöndem and Bıçak (32) on teachers, no significant difference was found between the anger expression styles and the age variable. Güleç (10), found in a study that the age variable only made a difference for extroverted anger. In the study conducted by Kesen et al. (14) with adolescents, it was stated that as the age of the adolescents increased, there was a significant increase in constant anger and expression of this anger. In a study by Çivilidağ (6), no significant difference was found according to the sub-dimensions of the anger variable at different age levels.

Türker (29) did not find a significant difference between the constant anger styles and the ages of the teachers in a study on them. In a study conducted by Akmaz (1) on managers, it was seen that there was no significant difference when the age variable was examined in terms of constant anger and anger expression styles.

Sezan (22) did not found a statistical difference between the anger expression style and the age variable. The literature reviews mentioned above do not show parallelism with the results of our study. It can be said that this difference stems from different sample groups. Teaching students appropriate methods of coping with anger, It was thought that this study would be a guide in controlling the anger of university students. However, the study cannot be generalized since it covers a certain region and the sample group is small. Therefore, creating larger and homogeneous sample groups is recommended for future studies.

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REFERENCES

1. Akmaz N. Eğitim Yöneticilerinin bağlanma stilleri ve sürekli öfke ve öfke ifade tarzları arasındaki ilişkinin incelenmesi. Yüksek Lisans Tezi, Yeditepe Üniversitesi Sosyal Bilimler Enstitüsü, 2009; İstanbul.
2. Altuntaş G. Boşanmış ebeveynler ile boşanmamış ebeveynlerin lise birinci, ikinci, üçüncü sınıflarında okuyan çocuklarının sürekli öfke ve öfke ifade tarzı, benlik saygısı ve anksiyete düzeylerinin karşılaştırılması. Yüksek Lisans Tezi, Maltepe Üniversitesi Sosyal Bilimler Enstitüsü, 2012; İstanbul.
3. Beyazaslan T. Öfke kontrol eğitiminin hipertansiyon tanısı alan hastaların öfke ve duygu kontrol durumlarına etkisi. Yüksek Lisans Tezi, Gaziantep Üniversitesi Sağlık Bilimleri Enstitüsü, 2012; Gaziantep.
4. Bostancı N, Çoban Ş, Tekin Z, Özen A. Üniversite öğrencilerinin cinsiyete göre öfke ifade etme biçimleri. Kriz Dergisi, 2006; 14, 9-18.
5. Buntaine RL, Costenbader VK. Self-reported differences in the experience and expression of anger between girls and boys. Sex Roles, 1997; 36, 625-37.
6. Çivilidağ A. An investigation on adolescents' cyber bullying and anger: A case study in Nigde province in Turkey. JASSS, 2013; 6, 497-511.
7. Elkin N, Karadağlı F. Üniversite Öğrencilerinin Öfke İfade Tarzı ve İlişkili Faktörler/Anger Expression and Related Factors in University Students. Anadolu Kliniği, 2015; 21, s. 64-71.
8. Elmas EH. Ortaöğretim öğrencilerinin benlik algı düzeyleri ile sürekli öfke ve öfke ifade tarzları arasındaki ilişkinin incelenmesi (kastamonu ili inebolu ilçesi örneği). Yüksek Lisans Tezi, Gazi Üniversitesi Eğitim Bilimleri Enstitüsü, 2009; Ankara.
9. Fiyakalı N. Anne babası boşanmış ve boşanmamış lise öğrencilerinin sürekli öfke düzeyi ve öfke ifade tarzlarının karşılaştırılması. Yüksek Lisans Tezi, Pamukkale Üniversitesi Sosyal Bilimler Enstitüsü, 2008; Denizli.
10. Güleç Y. Ergenlerin Öfke Yaşantıları, Benlik Algıları Ve Akademik Başarı İlişkileri. Yüksek Lisans Tezi, Marmara Üniversitesi Eğitim Bilimleri Enstitüsü, 2002; İstanbul.
11. Karasar N, Bilimsel araştırma yöntemi.Nobel Yayıncılık, 2004.
12. Karslı N. Öfke kontrolü ve dindarlık ilişkisi (Erzurum örneği). Doktora Tezi, Atatürk Üniversitesi Sosyal Bilimler Enstitüsü, 2011; Erzurum.
13. Kaya N, Kaya H, Atar NY, Turan N, Eskimez Z, Palloş A, Aktaş A. Hemşirelik ve ebelik öğrencilerinin öfke ve yalnızlık özellikleri. Hemşirelikte Eğitim ve Araştırma Dergisi, 2012; 9, 18- 26.
14. Kesen NF, Deniz M, Durmuşoğlu N. Ergenlerde saldırganlık ve öfke düzeyleri arasındaki ilişki: Yetiştirme Yurtları Üzerinde Bir araştırma. Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 2007; s.353-364.
15. Kökdemir H. Öfke ve öfke kontrolü. Pivolka, 2004; 12, s. 7-10.
16. Kuruoğlu D. Üniversite Öğrencilerinin Sürekli Öfke Düzeyleri, Öfke İfade Tarzları İle Obsesif Kompulsif Semptomları Arasındaki İlişki. Yüksek lisans tezi, Maltepe Üniversitesi Sosyal Bilimler Enstitüsü, 2009; İstanbul
17. Lerner H. Öfke Dansı (Çev. S Gül). 2. Baskı , İstanbul, Varlık Yayınları, 1996: 1-70.
18. Lopez,F.G.,&Thurman,C.W.Acognitive-behavioral investigation of an geramong college students. Cognitive Therapyand Research, 1986; 10 (2): 245-256.
19. Onbaşılı N. Kadın ve aile sağlığı merkezine başvuran çocuklarda öfke: anne ve çocuğun çocukluk dönemi istismar yaşantıları, aile işleyişi ve annenin öfke düzeyi açısından bir değerlendirme. Yüksek Lisans Tezi, Maltepe Üniversitesi Sosyal Bilimler Enstitüsü, 2011; İstanbul.
20. Öner N. Turkiyede kullanilan psikolojik testler bir basvuru kaynagi. 2. Baskı, Bogazici Universitesi Yayinlari, 1996; İstanbul.
21. Seyyar A. Davranış bilimleri terimleri: ansiklopedik sözlük, Beta Basım Yayım Dağıtım A.Ş, 2004; 1, 537-538.

22. Sezan T. Spor yapan ve yapmayan üniversite öğrencilerinin öfke ifade tarzları. Yüksek Lisans Tezi, Selçuk Üniversitesi Sağlık Bilimleri Enstitüsü, 2016; Konya.
23. Savaşır I, Şahin NH. Bilişsel-davranışçı terapilerde değerlendirme, sık kullanılan ölçekler, Türk Psikologlar Derneği Yayınları, 1997; Ankara.
24. Sülün Ö. Futbol Hakemlerinin Öfke ve Kızgınlık Düzeyleri İle Empatik Eğilim Düzeylerinin Karşılaştırılması. Yüksek Lisans Tezi, Karamanoğlu Mehmetbey Üniversitesi Sosyal Bilimler Enstitüsü, 2013; Karaman.
25. Tambağ H, Öz F. Aileleri ile birlikte ve yetiştirme yurtlarında yaşayan ergenlerin öfke ifade etme biçimleri. Kriz Dergisi, 2005; 13: 11-21.
26. Tatlılıoğlu K, Karaca M. Öfke olgusu hakkında sosyal psikolojik bir değerlendirme. The Journal of Academic Social Science Studies, 2013; 6 (11): 01-23.
27. Tiftik N. Adam öldürme eylemi nedeniyle hüküm giymiş olan kadınlarda, çocukluk örselenme yaşantılarına maruz kalma düzeyi, adil dünya inancı ve öfke ifade tarzları arasındaki ilişkinin incelenmesi. Yüksek Lisans Tezi, Maltepe Üniversitesi Sosyal Bilimler Enstitüsü, 2012; İstanbul.
28. Tuna D. Çözüm odaklı kısa süreli yaklaşıma dayalı öfke kontrolü eğitim programının lise öğrencilerinin öfke kontrolü ve iletişim becerileri düzeylerine etkisi. Yüksek Lisans Tezi, Dokuz Eylül Üniversitesi Eğitim Bilimleri Enstitüsü, 2012; İzmir.
29. Türker S. Öğretmenlerin çatışma yönetim stratejileri ile sürekli öfke ve öfke ifade düzeyleri arasındaki ilişkilerin incelenmesi. Yüksek lisans tezi, Sakarya Üniversitesi Sosyal Bilimler Enstitüsü, 2010; Sakarya.
30. Uslu G. Lise öğrencilerinin sürekli öfke ve öfke ifade düzeylerini yordayan bazı değişkenler. Yüksek Lisans Tezi, Gazi Üniversitesi Eğitim Bilimleri Enstitüsü, 2004; Ankara.
31. Yarcheski A, Mahon NE, Yarcheski TJ. Anger in early adolescent boys and girls with health manifestations. Nurs Res, 2002; 51: 229-36.
32. Yöndem ZD, Bıçak B. Öğretmen adaylarının öfke düzeyi ve öfke tarzları. Uluslararası İnsan Bilimleri Dergisi, 2008; 2(1): 1-15.

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Evaluation on Karabük University Students' Physical Activity Levels

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Abstract

The sedentary lifestyle is one of the most important problems for today's societies. Health-related behaviors that an individual gain early in his life affect the individual's quality of life in adulthood. The purpose of this study was to examine the physical activity (PA) levels of students studying at Karabük University according to the variables of gender, the program attended and body mass index (BMI). A total of 1717 students, 843 males and 874 females, studying in different departments, participated in the study. International Physical Activity Questionnaire (IPAQ) short form was used to collect data in the study. Frequency, percentage, Mann Whitney U, Kruskal-Wallis and chi-square tests were used to analyze the data. As a result of the research, it was seen that 27.8% of the students were not physically active, 38.2% of them had moderate physical activity levels, and 34% had sufficient PA levels. While 45.9% of male students had sufficient PA level, this rate was 22.4% for female students. A significant difference was found in PA scores of the students in terms of gender. A significant difference was found in the scores of vigorous PA according to the BMI of the students. As a result, it was observed that the physical activity level of the students was low, the physical activity level changed according to gender, and male students were more active than females. It can be said that BMI is effective on the level of Vigorous Physical Activity.

Keywords: Physical activity, exercise, BMI, university students

Karabük Üniversitesi Öğrencilerinin Fiziksel Aktivite Düzeylerinin Belirlenmesi

Özet

Hareketsiz yaşam tarzı günümüz toplumları için en önemli problemlerden biridir. Bireyin yaşamında erken dönemde kazandığı sağlıkla ilişkili davranışlar, bireyin erişkin yıllardaki yaşam kalitesini etkilemektedir. Bu araştırma Karabük Üniversitesinde öğrenim gören öğrencilerin fiziksel aktivite (FA) düzeylerini cinsiyet, öğrenim görülen program ve beden kütle indeksi (BKİ) değişkenlerine göre incelemek amacıyla yapılmıştır. Araştırmaya farklı bölümlerde öğrenim gören 843 erkek, 874 kadın toplam 1717 öğrenci katılmıştır. Araştırmada veri toplama amacıyla Uluslararası Fiziksel Aktivite Anketi (UFAA) kısa formu kullanılmıştır. Verilerin analizinde frekans, yüzde, Mann Whitney U, Kruskal-Wallis ve ki kare testleri kullanılmıştır. Araştırma sonucunda öğrencilerin %27,8'inin fiziksel olarak aktif olmadığı, %38,2'sinin orta düzeyde fiziksel aktivite düzeyine sahip olduğu ve %34'ünün yeterli FA düzeyine sahip olduğu görülmüştür. Erkek öğrencilerin %45,9'u yeterli FA düzeyine sahipken, bu oran kız öğrenciler için %22,4'tür. Öğrencilerin FA puanlarında cinsiyete göre anlamlı farklılık bulunmuştur. Öğrencilerin BKİ'lerine göre şiddetli FA puanlarında anlamlı farklılık bulunmuştur. Sonuç olarak öğrencilerin fiziksel aktivite düzeylerinin düşük olduğu, fiziksel aktivite düzeyinin cinsiyete göre değiştiği, erkek öğrencilerin kadınlara göre daha aktif oldukları gözlenmiştir. VKİ'nin Şiddetli Fiziksel Aktivite düzeyi üzerinde etkili olduğu söylenebilir.

Anahtar Kelimeler: Fiziksel aktivite, egzersiz, BKİ, üniversite öğrencileri

INTRODUCTION

The sedentary lifestyle is one of the most important problems for today's societies. Our lifestyle is changing with the rapid development of technology and industrialization. The development of technology that facilitates our daily life has led to a shortening of the time allocated for physical activity (PA). With the change of our lifestyle, sedentary lifestyle emerges as a very common situation, it has been revealed by numerous studies that this situation causes health problems such as cardiovascular diseases and musculoskeletal problems, and it has been stated that there is an increase in the mortality rates associated with these health problems (10, 11, 32, 36). It is stated by the World Health Organization (WHO) that if the necessary measures are not taken, these diseases will constitute 80% of the global disease burden in the following years and that these diseases will be responsible for seven out of every 10 deaths in developing countries (17).

Today, living by increasing the quality of life has become an important issue. Regular physical activity and nutrition are important elements in preventing chronic diseases, healthy aging and minimizing the health risks that may occur due to age. Physical activity should be added to daily life in order to eliminate sedentary life. Physical activity can be defined as all bodily movements performed with skeletal muscles and consuming more energy than at rest (6). In its simplest definition, it is the movement of the body to spend energy (18). American College of Sports Medicine (ACSM) and the American Heart Association (AHA) recommend to participate in moderate intensity aerobic physical activity for a minimum of 30 min on five days per week or vigorous intensity aerobic activity for a minimum of 20 min on three days per week. (21).

Physical activity is beneficial for health at all ages. Health benefits of regular physical activity for adults have been identified (28). The rate of attaining recommended physical activity declines rapidly from year to year among young people aged 18-24 (14). For example, in the UK, 73% of male students and 79% of women do not reach the recommended levels of physical activity (16), while in the United States almost half of college students do not reach the recommended physical activity levels (35). Haase et al. conducted a cross-sectional study with 19,928 university students from 23 countries with different cultural and economic development (16). As a result of the research, the frequency of inactivity was found to be 23% in Northwest Europe and the United States, 30% in Central and Eastern Europe, 39% in Mediterranean countries, 42% in Asia-Pacific countries, and 44% in developing countries and it was stated that these results varied depending on the cultural and economic development factors. As a result of a study conducted with adults in Brazil, it was stated that 41% of 3,182 people between the ages of 20-70 had physical inactivity; this rate was found to be 38% among people in the 20-29 age group (20).

Due to the fact that physical activity cannot be performed regularly and sufficiently, various suggestions are made by countries to increase the active lifestyle. Health-related behaviors that individual gains early in his life affect the individual's quality of life in adulthood. That is why it is important to investigate the health-related behaviors of young people (30). Strategies to improve physical activity in preventing chronic diseases have become an important public health approach (5). Determining the physical activity habits of the individuals and trying to correct the negative ones are important in terms of preventing the health problems of the individual in adulthood. University education is the most important process in which behavioral patterns are formed that will continue for years. Every positive behavior to be achieved in this process will take the individual one step further in bringing happiness. In this context, it is essential to determine the physical activity levels of university youth. The purpose of this research is to examine the physical activity level of the students studying at Karabük University according to the variables of gender and body mass index (BMI).

MATERIAL AND METHOD

The survey model was used in this study aiming to evaluate the physical activity levels of students studying at Karabük University in terms of various variables. 1,772 students studying at Karabük University in the 2020-2021 academic year participated in the study voluntarily. While faculty of engineering, business, letters and vocational school etc., students participated in the research, Physical Education and Sports School students were not included in the study. As a result of the examination, 55 students were excluded from the evaluation due to incomplete or incorrect data, and

the study was continued with 1,717 people. Data were collected via online survey tool. Ethics Committee permission was obtained from Karabuk University (Document Date: 10.04.2021 - E.24650)

Data Collection

To determine the physical activity levels of students in the study, a short form of "International Physical Activity Questionnaire - IPAQ" developed by Craig et al. was used (8). There are 8 versions of the questionnaire, it was designed as four short and four long forms and in our study, a short form consisting of 7 questions was used. A validity and reliability research were made for both short and long form of IPAQ to be used in Turkey (25, 29). The questionnaire provides information about sitting, walking, moderate activities and time spent in vigorous activities. The calculation of the total score includes the sum of time (minutes) and frequency (days) of walking, moderate vigorous activity, and vigorous activity. The sitting score (sedentary behavior level) is calculated separately. In the evaluation of all activities, the criterion is that each activity is done at least 10 minutes at a time. A score is obtained as "MET-minute/week" by multiplying the minute, day and MET value. In calculating the walking score, 3.3 MET for walking, 4 MET for moderate-intensive activity, and 8 MET for vigorous activity are taken. Physical activity levels are categorized as low (<600 MET-min/week), moderate (600-3000 MET-min/week) and high (> 3000 MET-min/week) (8, 22)

The height and body weight of the students were taken according to the students' own statements. Body Mass Index (BMI) was categorized according to the criteria published by the World Health Organization; “Less than 18.5 - underweight”, “18.5-24.99 - normal, “25-29.99 - Pre-obesity”, “30 and higher – obese” (19, 37).

Data Analysis

Descriptive statistics (frequency, percentage) and Mann Whitney U, Kruskal-Wallis and chi-square tests were used to analyze the data. Statistical analysis was done using nonparametric tests. Statistical significance between two groups was determined using Mann-Whitney U test and Kruskal Wallis tests were utilized for multiple comparisons. Chi-Square tests were performed to analyze associations between categorical variables. Due to the large standard deviations of the data revealed in the Physical Activity Questionnaire applications, it is generally not possible to meet the parametric test assumptions and the use of nonparametric tests is recommended (8). In this study, nonparametric statistical methods are preferred both because the assumptions were not fulfilled and are in line with the recommendation of the literature. In statistical analysis, the significance level is accepted as $p < 0.05$.

RESULTS

As a result of the analysis, the findings of the demographic and physical characteristics of the students participating in the study are presented in Table 1. 49.1% of the students participating in the study were male and 50.9% were female. 7% of the students participating in the study were in the underweight category, 71.3% were in the normal weight, 18.4% were pre-obesity and 3.3% were in the obese category. When the physical activity categories of the students participating in the study were examined, 27.8% of the students were in the low category, 38.2% were in the moderate category, and 34% were in the high category.

Table 1. Distribution of students according to gender, education level, BMI and activity levels

Gender (n=1717)	n	%
Male	843	49.1
Female	874	50.9
BMI		
Underweight	121	7
Normal	1,224	71.3
Pre-obesity	316	18.4
Obese	56	3.3
Activity Levels		
Low	478	27.8
Moderate	656	38.2
High	583	34

A statistically significant difference was found according to the gender variable in terms of Total PA, Vigorous PA, Moderate PA and Walking Scores of the students. While the total MET score for men is 3,237, it is 1,963 for women. When the time spent sitting by male and female students was examined, it was found that women spent more time sitting than men. Table 2 shows that the weekly energy consumption of the students participating in the study is 2,588 ± 2,636 MET-min/ week and walking activity constitutes a significant part of the total PA score.

Table 2. Comparison of Students' Physical Activity Scores According to Their Gender

	Total	Female		Male		z	p
Physical Activity	**Mean±SD**	**Mean±SD**	**Mean Rank**	**Mean±SD**	**Mean Rank**		
Total PA (MET-min/week)	2588±2636	1963±2065	744.46	3237±2986	977.75	-9,759	.000
Vigorous PA (MET-min/week)	728±1597	313±1019	737.34	1158±1939	985.14	-12,958	.000
Moderate PA (MET-min/week)	424±850	306±685	808.14	547±977	911.73	-4,992	.000
Walking Scores (MET-min/week)	1435±1317	1343±1291	822,74	1531±1336	896.59	-3,102	.002
Sitting Time (min)	470±469	486±415	691.89	455±513	613	-3,804	.000

When students' PA levels were examined in terms of gender variable it was found that while 21.8% of male students have "Low", 32.3% "Moderate" and 45.9% "High" PA levels, 33.6% of female students have "Low", 43% 9 of them have "Moderate" and 22.4% have "High" PA levels.

It was observed that there was a significant association between the gender variable and the students' PA levels ($p < 0.05$). Table 3 shows that 27.8% of the students are not physically active, 38.2% have moderate activity levels, and 34% have sufficient physical activity levels.

Table 3. Physical activity levels of students according to their gender

	Total (n=1717)		Male (n=843)		Female (n=874)			
Physical Activity Levels	N	%	%	%	n	%	χ2	p
Low	478	27,8	184	21.8	294	33.6	106,485	.000
Moderate	656	38,2	272	32.3	384	43.9		
High	583	34	387	45.9	196	22.4		
Total	1717	100	843	100	874	100		

When the BMIs of the students and their FA scores are compared, there is a significant difference between the underweight and normal weight groups and between the underweight and overweight groups in Vigorous PA dimension, and no difference was found in terms of BMI at other levels (Table 4).

Table 4. Comparison of Physical Activity Scores According to BMI Groups

Physical Activity	BMI	n	Mean Rank	χ2	sd	p	Significant Difference
Total PA (MET-min/week)	Underweight	121	841,73	2.003	3	.861	
	Normal	1224	857,75				
	Overweight	372	882,85				
	Obese	56	789,12				
Vigorous PA (MET-min/week)	Underweight	121	737,18	15,848	3	.001	Underweight - Normal
	Normal	1224	860,28				
	Overweight	372	904,71				Underweight - Overweight
	Obese	56	836,25				
Moderate PA (MET-min/week)	Underweight	121	878,89	.956	3	.646	
	Normal	1224	862,06				
	Overweight	372	845,16				
	Obese	56	827,12				
Walking Scores (MET-min/week)	Underweight	121	914,93	2,614	3	.366	
	Normal	1224	858,70				
	Overweight	372	850,16				
	Obese	56	794,54				
Sitting (min)	Underweight	93	675,47	7,421	3	.499	
	Normal	931	642,90				
	Overweight	276	646,00				
	Obese	37	808,01				

DISCUSSION

In this study, the physical activity levels of the students studying at Karabük University were examined according to their gender and BMI values. Findings obtained from the study showed that male students have higher activity levels than female. In parallel with this, the sitting times of female students were found to be significantly higher than male. It was observed that 34% of the students participating in the study had sufficient PA levels and 66% of them had inadequate PA levels. The mean sitting time of the female students was found to be 486 minutes, thus showing that female students spend more time sitting than male students. These results demonstrate the fact that physical inactivity is at a serious level and students spend most of their time sitting.

In a study conducted with university students, it was stated that male students were more active and 82% of the students had inadequate PA levels (30). In another study, it was found that the PA levels of female students were lower than that of male students, and 64% of the students had inadequate PA levels (24). Another study conducted by Erdoğan and Revan found that physical activity levels vary by department and men have higher physical activity levels than women (12). National and international studies in the literature support this finding (2-4, 7, 9, 13, 15, 23, 26, 27, 34, 38). The reason why the physical activity level of men is higher than women may be related to anatomical structure and social roles.

In our study, a significant difference was found between the Vigorous PA scores of the underweight and normal weights, and underweight and overweight individuals according to the BMI variable. We can say that underweight students avoid Vigorous PA. When the studies are examined, different results are encountered. In a study examining the physical activities of normal weight and obese university students, it was stated that 8.5% of university students were obese, and the physical activity measurement was different between normal weighted and obese groups in terms of Physical Activity Assessment Questionnaire (PAAQ) stairs, PAAQ sports, PAAQ transportation and PAAQ total variables. A negative relationship was found between BMI and PAAQ stairs, sports, transportation and total values, and as BMI value increased, PAAQ sports and total values decreased (31). In a study examining the PA levels of young individuals with low back pain, PA scores differ according to the BMI variable (1). In a study examining the PA levels of desk workers, a significant difference was found in the PA levels of the groups with BMI <25 kg / m2 and BMI> 25 kg / m2 (34). In a study conducted with female students studying at the Faculty of Health Sciences, no statistically significant difference was found between the activity levels of the students whose BMI value was below and above 25 kg / m2 (33). In a study conducted with university students, no difference was found between those who were overweight and those who were not (25). In another study examining the PA levels of university students, no significant difference was found between the BMIs and PA levels of the students (23). Factors such as the location of the studies and the age of the sample groups may be the reasons for the different results.

This study has its limitations. Physical activity was assessed using self-reported IPAQ short form. More accurate results can be obtained in longitudinal studies using devices such as Pedometer, actigraph. In addition, BMI was categorized into 2 groups as overweight and non-overweight in other studies, in this study, it was categorized into 4 groups according to the WHO recommendation.

As a result, in this study, the physical activity levels of the students studying at Karabük University were examined according to the variables of gender and BMI, and it was found that the PA level of the students was insufficient. A significant difference was found in PA levels and PA scores according to the gender variable. When we compare the intensity of physical activity men shows significantly higher PA. The highest gender differences are found in vigorous PA. According to the variable of BMI, a significant difference was found between the underweight and normal weight groups in Vigorous PA dimension and between the underweight and overweight groups. In particular, it is recommended to plan to increase the physical activity levels of female students and to take into account the physical activity preferences of the students in the course and course-like activities. It is believed that increasing the opportunities to participate in physical activity on the university campus and encouraging practices will benefit.

REFERENCES

1. Akduman V, Timurtaş E, Mete E, Kartal M, Yıldız A, Sarı Z. Does physical activity level affect low back pain? Adnan Menderes Üniversitesi Sağlık Bilimleri Fakültesi Dergisi. 2019;3(1):11-8.
2. Arıkan Ş, Revan S. Relationship Between Physical Activity Levels and Body Compositions of University Students. Turkish Journal of Sport and Exercise. 2019.
3. Arslan S, Daskapan A, Cakir B. Specification of nutritional and physical activity habits of university students. TAF Preventive Medicine Bulletin. 2016;15(3):171-80.
4. Bergier J, Kapka-Skrzypczak L, Biliński P, Paprzycki P, Wojtyła A. Physical activity of Polish adolescents and young adults according to IPAQ: a population based study. Ann Agric Environ Med. 2012;19(1):109-15.
5. Bonevski B, Guillaumier A, Paul C, Walsh R. The vocational education setting for health promotion: a survey of students' health risk behaviours and preferences for help. Health Promot J Austr. 2013;24(3):185-91.
6. Bouchard C, Blair SN, Haskell W. Physical Activity and Health: Human Kinetics; 2012.
7. Cevdet C, İnce ML, Şeref Ç. Üniversite Öğrencilerinin Fiziksel Aktivite Düzeyleri ve Fiziksel Aktivite Tercihleri. Gazi Beden Eğitimi ve Spor Bilimleri Dergisi. 2009;14(2):23-32.
8. Craig CL, Marshall AL, Sjostrom M, Bauman AE, Booth ML, Ainsworth BE, et al. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc. 2003;35(8):1381-95.
9. Dagmar S, Erik S, Karel F, Ales S. Gender Differences in Physical Activity, Sedentary Behavior and BMI in the Liberec Region: the IPAQ Study in 2002-2009. J Hum Kinet. 2011;28:123-31.
10. Das P, Horton R. Physical activity—time to take it seriously and regularly. The Lancet. 2016;388(10051):1254-5.
11. Ekelund U, Steene-Johannessen J, Brown WJ, Fagerland MW, Owen N, Powell KE, et al. Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women. The Lancet. 2016;388(10051):1302-10.
12. Erdoğan B, Revan S. Üniversite Öğrencilerinin Fiziksel Aktivite Düzeylerinin Belirlenmesi. Kilis 7 Aralık Üniversitesi Beden Eğitimi ve Spor Bilimleri Dergisi. 2019;3(2):1-7.
13. Erdoğan M, Certel Z, Güvenç A. Masa Başında Çalışanlarda Fiziksel Aktivite Düzeyi : Obezite ve Diğer Özelliklere Göre İncelenmesi (Akdeniz Üniversitesi Tıp Fakültesi Hastanesi Örneği). Spor Hekimliği Dergisi. 2011;46(3):97-107.
14. Grim M, Hortz B, Petosa R. Impact evaluation of a pilot web-based intervention to increase physical activity. Am J Health Promot. 2011;25(4):227-30.
15. Guthold R, Ono T, Strong KL, Chatterji S, Morabia A. Worldwide variability in physical inactivity a 51-country survey. Am J Prev Med. 2008;34(6):486-94.
16. Haase A, Steptoe A, Sallis JF, Wardle J. Leisure-time physical activity in university students from 23 countries: associations with health beliefs, risk awareness, and national economic development. Prev Med. 2004;39(1):182-90.
17. Hacettepe Üniversitesi Tıp Fakültesi. Ulusal Hastalık Yükü Çalışması Sonuçları ve Çözüm Önerileri. Hacettepe Üniversitesi Tıp Fakültesi; 2017.
18. Halk Sağlığı Genel Müdürlüğü. Fiziksel Aktivite Nedir? 2019 [Available from: https://hsgm.saglik.gov.tr/tr/fiziksel-aktivite/fiziksel-aktivite-nedir.html.
19. Halk Sağlığı Genel Müdürlüğü. Obezite Nasıl Saptanır? 2019 [Available from: https://hsgm.saglik.gov.tr/tr/obezite/obezite-nasil-saptanir.html.
20. Hallal PC, Victora CG, Wells JC, Lima RC. Physical inactivity: prevalence and associated variables in Brazilian adults. Med Sci Sports Exerc. 2003;35(11):1894-900.
21. Haskell WL, Lee IM, Pate RR, Powell KE, Blair SN, Franklin BA, et al. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. Med Sci Sports Exerc. 2007;39(8):1423-34.
22. IPAQ Group. International Physical Activity Questionnaire: International Physical Activity Questionnaire Group; [Available from: https://sites.google.com/site/theipaq.
23. Kartal M, Balcı E. Evaluation of physical activity level and related factors in students' of Harran Universty. Health Care Academician Journal. 2018;5(4):301-.
24. Ölçücü B, Vatansever Ş, Özcan G, Çelik A, Paktaş Y. Üniversite Öğrencilerinde Fiziksel Aktivite Düzeyi İle Depresyon ve Anksiyete İlişkisi. Uluslararası Türk Eğitim Bilimleri Dergisi. 2015:294-.
25. Öztürk M. Üniversitede Eğitim-Öğretim Gören Öğrencilerde Uluslararası Fiziksel Aktivite Anketinin Geçerliliği Ve Güvenirliği ve Fiziksel Aktivite Düzeylerinin Belirlenmesi. Ankara: Hacettepe Üniversitesi; 2005.
26. Papathanasiou G, Papandreou M, Galanos A, Kortianou E, Tsepis E, Kalfakakou V, et al. Smoking and physical activity interrelations in health science students. Is smoking associated with physical inactivity in young adults? Hellenic J Cardiol. 2012;53(1):17-25.
27. Pearson N, Atkin AJ, Biddle SJ, Gorely T, Edwardson C. Patterns of adolescent physical activity and dietary behaviours. Int J Behav Nutr Phys Act. 2009;6:45.
28. Reiner M, Niermann C, Jekauc D, Woll A. Long-term health benefits of physical activity--a systematic review of longitudinal studies. BMC Public Health. 2013;13(1):813.
29. Saglam M, Arikan H, Savci S, Inal-Ince D, Bosnak-Guclu M, Karabulut E, et al. International physical activity questionnaire: reliability and validity of the Turkish version. Percept Mot Skills. 2010;111(1):278-84.
30. Savcı S, Öztürk M, Arıkan H, İnal İnce D, Tokgözoğlu L. Physical activity levels of university students. Turk Kardiyol Dern Ars. 2006;34(3):166-72.
31. Soyuer F, Ünalan D, Elmalı F. Physical activity in normal weight and obese university students. Journal of Human Sciences. 2010;7(2):862-72.
32. T.C Sağlık Bakanlığı. Türkiye Fiziksel Aktivite Rehberi. 2 ed. Ankara: T.C. Sağlık Bakanlığı Türkiye Halk Sağlığı Kurumu Obezite, Diyabet ve Metabolik Hastalıklar Daire Başkanlığı; 2014.
33. Ulaş Kadıoğlu B, Uncu F. Sağlık Bilimleri Fakültesinde Öğrenim Gören Kız Öğrencilerin Vücut Kütle İndeksi ve Fiziksel Aktivite Düzeyleri. Journal of Current Researches on Health Sector. 2017;7(2):133-42.
34. Vural Ö, Eler S, GÜZel NA. Masa BaŞi ÇaliŞanlarda FİzİKsel Aktİvİte DÜzeyİ Ve YaŞam Kalİtesİ İlİŞkİsİ. Ankara Üniversitesi Beden Eğitimi ve Spor Yüksekokulu SPORMETRE Beden Eğitimi ve Spor Bilimleri Dergisi. 2010;8(2):069-75.
35. Weinstock J. A review of exercise as intervention for sedentary hazardous drinking college students: rationale and issues. J Am Coll Health. 2010;58(6):539-44.
36. World Health Organization. Physical Inactivity: A Global Public Health Problem 2010 [Available from: http://www.who.int/dietphysicalactivity/factsheet_inactivity/en/.
37. World Health Organization. Body mass index - BMI 2020 [Available from: https://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi.
38. Yerlisu Lapa T, Haşıl Korkmaz N. Effect of physical activity levels on negative and positive affect comparison to the gender: Sample of Akdeniz and Uludağ Universities. Journal of Human Sciences. 2017;14(4):3177-.

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Applications Towards Sports During Covid-19 Pandemic

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Abstract

COVID-19 pandemic, which has taken hold of the world, causes great difficulties in sports as it causes in any other field. Sports facilities are shut; training sessions and competitions are suspended temporarily. Even though the vaccination process has started, the COVID-19 pandemic still continues, keeps affecting our lives and some restrictions are put into application from time to time. This study focuses on the effects of COVID-19 on people performing sports activities and on the sports applications during this period. In this research, information about sports applications during the COVID-19 period is presented. Moreover, various suggestions are provided for supporting sports applications and for ensuring that sports activities can be performed safely during and after the pandemic process. This study shows how vital is the role played by sports and physical activities in terms of physical and mental condition and health in general.

Key Words: COVID-19, sports, application.

Covid-19 Döneminde Spora Yönelik Uygulamalar

Özet

Tüm dünyayı etkisi altına alan COVID-19 salgını, her alanda olduğu gibi spor alanında da büyük zorluklara neden olmuştur. Spor mekanları kapatılmış, antrenmanlara ve müsabakalara geçici olarak ara verilmiştir. Günümüzde aşılama yöntemi başlamış olmasına rağmen, halen COVID-19 pandemisi devam etmekte, etkisini sürdürmekte ve dönem dönem kısıtlamalar gündeme gelmektedir. Bu çalışma, COVID-19'un spor yapan bireyler üzerindeki etkisine ve bu dönemdeki spor uygulamalarına odaklanmıştır. Araştırmada betimsel araştırma türlerinden tarama yöntemi kullanılmıştır. Bu araştırmada, COVID-19 dönemi ve sonrasındaki spor uygulamaları hakkında bilgiler sunulmuştur. Araştırmada ayrıca, salgın sırasında ve sonrasındaki spor aktivitelerini desteklemek, spor aktivitelerinin güvenli bir şekilde yapılabilmesini sağlamak için çeşitli önerilerde bulunulmuştur. Yapılan bu çalışma, COVID-19 sürecinde fiziksel, zihinsel ve sağlık açısından sporun ve fiziksel aktivitelerin oynadığı hayati rolün ne kadar önemli olduğunu göstermektedir.

Anahtar Kelimeler: COVID-19, spor, uygulama**.**

INTRODUCTION

COVID-19 is a pandemic disease which started at the last month of 2019 in Wuhan, China with the increasing number of chronic pneumonia cases (1). COVID-19, caused the beginning of a worrisome period of time worldwide. Cities and even all countries of the world have been facing with this pandemic whose exact treatment is still unknown. The rapid spread of COVID-19 leads to restrictions or halts in sports or cultural activities in many areas. In order to prevent the spread of the pandemic, various precautions were taken by the authorities in health, finance, education, sports, etc. (2). It is stated in the researches performed on the subject that there have been a need for comprehensive and precautionary strategies to hinder the spread of the pandemic and to cope with its outcomes since the moment when pandemic started with millions of confirmed cases over 180 countries worldwide (3,4). Each country tends to develop its own strategy to be able to cope with the pandemic accordingly.

Restriction of sports and physical activities which are among the most important components of social life, as far as severing them from all their ties

and reducing them into private space due to COVID-19, depicts a worrying picture in terms of the regularity of applications and getting the expected efficiency from these activities (5). During the pandemic period, as it is in normal periods of life, the possible positive contributions of regular sports and physical activities on health and social life is a fact that should not be ignored.

Effects of COVID-19 on People who Do Sports

Crowded sports organizations of global sports industry which make sport persons and spectators meet together and in which physical contact and social interaction are immense, cause the pandemic spread rapidly (6. It is stressed that concerts, collective religious practices or collective organizations in sports branches make it easy for the pandemic spread rapidly. Gilat and Cole (7) also state that easy and fast spread of pandemics like COVID-19 during big sports events can create an affect equal to that of a biological bomb. Similarly, in the research conducted on football players, Ying-ying et al. (8) express that the risk of virus spread during games is quite high as a player has close physical contact and performs physical actions containing infection risks many times during games.

The global spread of the pandemic makes it impossible to perform many regular daily activities of life including sports and physical activities. The pandemic have been limiting the sports and physical activities of professional or amateur individuals or groups from all strata. For instance, as they try to keep their forms at home, professional athletes need to reregulate their trainings according to the conditions of the pandemic and they face the risk of losing their professional sponsors directing and supporting them. Cancellations or suspensions of games and competitions in global or regional scale deprive people doing sports of the sources which help them strengthen social harmony, contribute to emotional excitement and incite them for practicing more physical activities (9). It is obvious that COVID-19 affects individuals performing any branch of sports regardless of their purpose.

As athletes take part in the competitive environment of sports, they are careful about their training and daily lives greatly (10). Professional athletes must work hard and efficiently and pass from various stages of education for being successful in their relative branches. As long as athletes can achieve these, they will prove themselves in their branches (11). Furthermore, suspended competitions due to COVID-19, social restrictions and ongoing uncertainty of pandemic will reflect on the daily lives of athletes. At times like this, it is not possible to avoid experiencing various problems and hardships in any area. At a time when championships are suspended and leagues are paused, professionals who live off sports lose income and diagnosis of COVID-19 for these athletes get them and their families worried. On the other hand, how transfer processes get affected from this situation is not certain. Transfer budgets are reduced obviously. It is expected that players who are in demand and meet their values will be transferred for good amount of money, and that amateur branches will also get shrunk or shut completely. Moreover, these and similar situations cause athletes to experience financial concerns (12). From April 2020, as most professional sports leagues have been suspended, thousands of athletes and sports clubs are in need of support for avoiding bankruptcy. For this reason, effective measures must be taken against these problems that will affect participation in sports and athletes for a long time (13).

COVID-19 also causes disruptions to the training and competition programs of athletes (14 Chen et al., 2020). These disruptions in COVID-19 training programs will affect their respiratory system and training capacity negatively in long term by affecting physical - physiological parameters of athletes (13). Social isolation and quarantine processes cause a decrease in their physical activity levels and a decrease in their maximal and sub-maximal training performances as they limit the training movements specific to their branches. Those losses observed in aerobic performances due to the limitations, affect cardiovascular function negatively or weaken the muscle metabolism. Since regular training cannot be performed during this period, it is observed that VO2 max decreases within 2-4 weeks, and losses increase further in the period that proceeds this 2-4 weeks (15).

Professional athletes have a career strategy that will ease the obstacles they face and carry themselves to their goals. Countries develop strategies aiming at solutions within their might. The goodness or badness of the means of countries will affect the athletes` career strategies leading them to their goals in a good way or bad way (16). Training programmes of the athletes intended for competitions must be regular. However, it is also a mystery that what type of approach must be

adopted against the disruption of access to the professional facilities that trainings can be performed and to the disciplined support teams. It will not be a sufficient application to take health precautions only and postpone the time line in situations like these (17).

Precautions taken during the COVID pandemic process has been affecting all individuals involved in sports including the ones who do it for recreative purposes but not professionally. No matter what branch it is, there is still an ongoing ambiguity about the creation of necessary conditions for letting spectators come together as they used to do before the pandemic and for ensuring that athletes avoid the physical contacts which would put themselves in danger (7). In this context, there are many questions to answer to and brand-new questions arise as new answers are reached. For example, it is not known exactly what kind of impact this situation will have on the health or the performance of athletes affected by COVID-19 in long term (18). When the subject is considered in terms of physical activity, it is stated in the epidemic report of the United Nations (UN) that many people cannot participate in sports activities outside their homes due to the pandemic restricting the areas of physical activity, and under these conditions most people are inclined towards being less physically active. UN (9) also states that lack of physical activity and exercise isolates many people from ordinary social life and this situation has negative effects on their participation in physical activities by causing stress and anxiety. However, in such situations, an individual should be strong physically and mentally. When the situation in question is considered in terms of individuals who do sports, it raises the question of at what degree does the pandemic affect the participation levels of individuals involved in sports in physical activities and sports.

Sports-Oriented Applications during the COVID-19 Process

It is observed that the expression of "nothing will be the same after COVID-19", expressed by all authorities, is directly in line with the thoughts of sports fans about participating in competitions during COVID-19 process. In a study conducted in the United States, in participating competitions, the availability of disinfectants at stadiums, the application of disinfection procedures, the health screening of employees and the sale of tickets as half of the stadium capacity become prominent among the most important factors. Therefore, it is predicted that the effects of COVID-19 will continue for a while and the recovery process will take some time (19).

As the world begins to recover from COVID-19 process, there will be important issues to address to ensure the prosperity of sports activities and sports organizations at all levels. Regardless of their age, it is important for everybody to apply physical activities in order to stay healthy including at situations in which most people have no actual experience with the pandemic at all. Physical activity experts indicate that 150-300 minutes of moderate exercise and movements for strengthening muscles for two sessions twice per week are very beneficial (9). Every single minute that is spent actively is important for a healthier life (20,21). It is now a very well-known fact that regular physical activities have positive impacts on many health outcomes (22,23). Researches on the subject shows that regular physical activities bears many benefits in terms of physical, physiologic health parameters and positive health outcomes (24,25).

For many people it is possible to perform physical activities without having special equipments or a special space at home during the pandemic process. In situations like this in which there is a necessity to stay indoors for a long time, many different options can be found for staying active throughout the day. For instance, stretching movements, routine household chores, climbing stairs, dance while listening to music or various exercise movements can be performed. In addition to this, for people who have internet access there are many free web resources which show the ways of being able to stay active during the pandemic process. Through internet, it is possible to access games with physical activity content which can attract the attention of people from all ages and groups and can be performed in small spaces such as home environment. Another important aspect of keeping physical fitness is the strength training which can provide necessary mobility for those who have physical disability and which can help in protecting muscle strength (9). What is important here is to be individuals who have awareness of doing sports under all situations and conditions. It is also important to expose the necessity of improving various ways to bring people in the habit of doing sports and physical activities.

Demiray (25), a national athlete and sports futurist who emphasizes the importance of physical activity during the epidemic, states that people understand the importance of doing physical activity at home better during the epidemic process and that the rate of physical activity will increase after the epidemic period. Demiray (25) states that during the time that is spent at home, it is perceived better that staying active comes first among the irreplaceable things. In this respect, it is necessary to make the best out of the available means in order to bring in sports and physical activities in societal level. Under these conditions, the use of technology which has become an important part of human life and makes daily life easier, in sports is on the agenda.

In the long run, technological innovations which shape many sectors have started to influence the entertainment styles, behaviours, needs and values of people in sports industry as well. The increase in technological trends in sports indicates that the change which will be observed in sports industry in the next ten years will be much more than that of the previous few decades. The points that really needs to be pondered on here should be "What type of sport will be the most striking after the epidemic?", "How will sports be structured in the best way possible?" and "How will people enjoy sports?" There will also be a need for developing a deeper interaction and a more diverse content strategy for existing sports to meet the changing behaviour and new demographic needs of sports enthusiasts (27).

It is predicted that sports industry will become digitalized rapidly with the pandemic process. This process will accelerate the integration of technology with sports. With the integration of sports into technology, mobile phones, which identify with people and recognize them, will help the individuals organise their daily lives like a mentor via physical activities, training programmes, diet and motivation programmes that are designed specifically for the person using it thanks to the applications which gather personal data

Due to the time limits, people will incline towards doing sports at home. There will be many changes for amateurs during this process as well. For example trainers will need to become more acquainted with technology more than anyone in order not to be left behind. Trainers will be able to lead people in doing sports activities from their homes, in front of their cameras without any limitation of time or space thanks to technological equipments. By this way, it will be possible for people to follow trainers/instructors also from home during the social distancing rule applied in the pandemic period (25). With the pandemic, there is a huge increase in the use of web-based online applications for the purpose of doing sports and physical activities worldwide.

Thanks to the online content which can be accessed from all over the world and which can be adapted to different people, people from all groups can access activities that all family members can participate such as opening, stretching, meditation, yoga and dance lessons. In addition to this, many people can get access to fitness apps, online videos and audio classes changing daily for reasonable prices. Furthermore, there are countless online fitness presentations on social media platforms. Most of these classes offer sports activities in which household items or items of daily use can be used instead of special equipments (9).

However, everyone might not have the means to access such online contents that digital technology offers. So, access to such sources is far from being universal. In underdeveloped or developing countries, access to broadband is often limited and problematic or not available at all. For this reason alternative methods such as television and radio broadcasts might be used for reaching these people. As a matter of fact, television and radio broadcasts that offer physical activity and various sports exercises and encourage these, makes it possible for many households who are deprived of the technological means, who do not have internet access and live under risky conditions to reach such activities.

Recommendations for Sports Applications in the COVID-19 Period

In this process, sports can be used as a means to develop co-operation and sportsmanship among individuals who are affected by social isolation, and to encourage friendly competition away from conflict (9). Today, during the pandemic process, many individuals face with a situation in which they might lose the achievements that they have gained owing to their participation in sports. As the pandemic forces people who do sports or who are involved in sports to stay at home, virtual sports environments might be used as an alternative way for them to continue their sports activities from

home. To be able to get the most out of such sports and physical activities which are performed by using televisions and internet resources, the process must be led well and its planning must be done properly.

Doing exercise results in an increase in benign hormones. This is a scientific fact. Even the easiest exercises which anyone can do have many positive contributions. Exercises reduce the stress level of an individual, cause perspiration and cleanse toxins. What matters is to make a proper planning for an exercise. A well planned exercise can attract people to sports. In this process, it is very important to adapt people to the system step by step. Spans and days must be increased slowly. Trainers are important in terms of programming. The statements and applications of trainers are vital in this process (25). Digitalization might make significant contributions to the development of trainers. On the other hand, it might also lead to some disadvantages.

There is little doubt that daily lives and routine applications of sports participants are changing or are being suspended by the epidemic. This situation means that interaction and methods for providing training will be reconstructed fundamentally. On the other hand, trainers might need to reassess how athletes will be monitored and the situations like injuries, training sessions and other situations that need feedback, due to the social distancing between the trainers and athletes. A webcam or a computer screen might provide a limited vision in terms of monitoring sports participants. Such situations can restrict the effectiveness of a trainer in sports where technical and physical skills are very important. Moreover, it can also lead to changes in the programs implemented due to the social distancing between trainers and athletes. For example, this situation may lead to the replacement of trainers with technical based strength and conditioning applications. Similarly, the trainers` ability to foster the development of a team, its cohesion and the sense of belonging will likely to change.

This period when it is spent away from all kinds of sports environment might give a chance to trainers to ponder on the applications they perform, to communicate with trainers of other branches, to exchange information and to evaluate the process. These might lead to changes in training philosophy and behaviour. These deductions offer new suggestions even though they are contradictory. For instance, in many countries, it is decided that the duration of physical education must be kept shorter to reduce physical contact. Yet, along with this, the importance of staying active in this period is also emphasized (28). How should these contradictory suggestions be applied can cause uncertainty, and if teaching and training applications are to be regulated, such factors must be researched. Furthermore, how these changes should be applied and situations regarding their effects might take time in terms of determining the best methods that can be applied in this process. And also trainers should support their athletes by interacting with them in terms of their positions. Trainers need to show optimism about the future of their team and maintain regular communication and sustain team spirit with their athletes. Some trainers might need support for planning the near future realistically and for finding new professional opportunities in the emerging socio-economic environment. They might also need to strengthen their connections with their friends and relatives.

Another problem that might affect sports sector is the problems resulting from limitations and rules. Ball games are the most popular ones among children and teenagers. At countries in which ball games are restricted, young athletes should be encouraged for accepting the reality, for leaving the sports that they are interested in temporarily due to the limitations of social interactions and for doing entertaining physical activities that help protecting their health and are physically appropriate. This change may not be so easy for children and teenagers. The loss of social interaction for children and teenagers might put their relation with screen at risk. Early research findings show that the epidemic process increases anxiety and depression in youngsters (29) and waste of time (30). In a pessimistic or even in a moderate scenario, probably millions of children and teenagers might not return to their sports groups after the effects of pandemics will have ended.

Sports and exercise psychologists, physical education teachers, trainers and parents play a vital role in providing (online) psychological support to students and young athletes. These people can help young athletes improve routine tasks and self-regulation skills in this period. At the same time, they can make contributions to their improvement of developing pro-social motives for maintaining social distancing. In this period of time, support can be received from screens. These individuals should

not be subjected to excessive pressure to maintain social distancing (31). Maintaining team spirit during this period of time is important for young athletes. During social isolation, online group meetings can be held in cases where there is a need for coming together for supporting team spirit and screen help. By this way, social distancing can be maintained and mutual interaction can be established at the same time. Sports psychologists, can help athletes develop skills to cope with anxiety and detect athletes who are affected negatively from the pandemic process or social isolation, and can direct those who experience problems to mental health professionals. The crisis caused by the pandemic can be turn into an opportunity to help athletes and their parents communicate with each other and improve their family relationships (32). The restrictions and rules caused by the epidemic raise questions about to what extent sports can be applicable in the future. It is necessary to ponder on some issues such as whether the globalisation of competitive sports can continue at a sustainable pace, or whether the restrictions that prioritize health protection should be included in the action or not.

Relatively little has been said about the impact of social distancing or isolation on sports at societal basis or local level. For instance, what would happen if the closeness of sports participants in the society would become a threat? What if "Sports for all` could not be sustained due to its increasing health risks for people such as for those who are pregnant, elderly or with chronic illnesses? What does it mean for sports clubs and institutions to be described in the community they function as the channels which spread epidemics/pandemics such as COVID-19 which are threatening human lives. How will these factors affect hygiene rules in sports, their applications and organisation processes? For example, Royal Dutch Football Association announced that spitting on the football field will result in booking. To what extend will it be possible to build sports around these existing organizational blocs that are rooted in the concepts of community, inclusion and mutual support? (28).

Nevertheless, due to the way the virus spreads, some types of sports might be affected more than others. For instance, Dutch team or indoor sports are more limited than individual or outdoor sports (28). Such situations show that the effects of the current pandemic are huge and affect the sports industry deeply. Even if it is not possible to eliminate the effects of the pandemic completely, methods to be applied in the normalisation process can help ease the existing effects.

CONCLUSION

COVID-19 period is a time when there is confusion about how to do things in the field of sports, as in every field. It is obvious that this confusion caused by COVID-19 has changed the habits of individuals to do sports and caused some difficulties and troubles in the sports community. However, it is a fact that the impact of COVID-19 continues. Social cohesion and cooperation are essential in order to reach a solution stage by reducing the effects of COVID-19 pandemic and to carry out this struggle in a healthy way. This harmony includes members of the society who do sports or who are connected to sports in one way or another.

This study shows how vital the role that sports and physical activities related to sports play in terms of physical, mental and general health during COVID-19 process. The allowing of some sports activities with the normalization process is an exciting situation for millions of people who perform sports activities on their own will and who benefit from sports physically, mentally and socially. It is a fact that the risk cannot be eliminated in sports completely. However, on the condition that caution and care is maintained, the risks at sports can be minimized and benefits of sports can be enjoyed once again. For this reason, it is important for individuals in the sports community to act with a sense of responsibility in reducing or eliminating the material and spiritual damages that the epidemic causes and might cause in the future.

In this study, the impact of COIVID-19 on sports and the measures that can be taken in sports are emphasized with a multifaceted approach. Although it is difficult to determine the final effects of the COVID-19 epidemic on sports in this process, the information presented in this study can help athletes, coaches, Physical Education Teachers, trainers to carry out the epidemic process in a safer and more efficient way. The easy transmission of COVID-19 increases the risk of transmission in sports environments. In order to prevent infection, it is recommended that individuals minimize contact in contact sports, follow personal hygiene rules, avoid risky behaviors in the areas where they do sports, and adjust their sports activities according to the epidemic case rates in the region they live.

REFERENCES.

1. Huang, Y., Zhao, N.Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 epidemic in China: A web-based cross-sectional survey. medRxiv. 2020; 288: 11954.
2. Parnell, D., Widdop, P., Bond, A., Wilson, R. COVID-19, networks and sport. Managing Sport and Leisure, 2020; 1-7.
3. Xiang, Y.T. Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. Lancet Psychiatry, 2020; 7(3): 228 –229.
4. Mamun, M. A., Griffiths, M.D. First COVID-19 suicide casein Bangladesh due to fear ofCOVID-19 and xenophobia: possible suicide prevention strategies. Asian J of Psychiatry, 2020; 51:102073.
5. Türkmen, M, Özsarı, A. Covid-19 salgını ve spor sektörüne etkileri. Int J of Sport Culture and Sci, 2020; 8 (2): 55-67.
6. Memish, Z.A., Steffen, R., White, P., Dar, O., Azhar, E.I., Sharma, A., Zumla, A. Mass gatherings medicine: public health issues arising from mass gathering religious andsporting events. The Lancet, 2019; 393(1085): 2073–2084.
7. Gilat, R., & Cole, B. J. Editorial Commentary: COVID-19, medicine, and sports. Arthroscopy, Sports Medicine, and Rehabilitation, 2020; 2(3): 175,176.
8. Ying-YingWong A.,Samuel Ka-KinLing S.,Lobo Hung-TakLouie L., Ying-KanLaw, G., Chi-HungSo, R.,Chi-WoLee, D., Chung-FaiYau, F., Shu-HangYung, P. Impact of the COVID-19 pandemic on sports and exercise. Asia-Pacific J of Sports Medicine, Arthroscopy, Rehabilitation and Technology 2020; 22: 39-44.
9. United Nations (UN). [İnternet]. The impact of COVID-19 on sport, physical activity and well-being and its effects on social development. [cited 2021 Apr 12]. Avaliable from: https://www.un.org/development/desa/dspd/2020/05/covid-19-sport/
10. Genç, D. A. Spor hukuku. İstanbul: Alfa Basım, 1998.
11. Afacan, E. Spor Felsefesi. Ankara: Akademisyen Yayınevi, 2019.
12. Büyükbaykal, G. [İnternet]. Pandemi sürecinin spor sektörüne etkileri, [cited 2021 Apr 12]. Avaliable from: https://www.istanbul.edu.tr/tr/haber/pandemi-sureci-spor-endustrisini-nasil-etkiledi
13. Timpka, T. (2020). Sports health during the SARS-Cov-2 pandemic. Sports Medicine, 2020; 50(8):1413-1416.
14. Chen, N., Zhou, M., Dong, X., Qu, J., Gong, F., Han, Y., et al. Epidemiological and clinical characteris¬tics of 99 cases of 2019 novel coronavirus pneumo¬nia in Wuhan, China: a descriptive study. The Lancet, 2020; 395(10223): 507-513.
15. Jukic, I., Calleja-González, J., Cos, F., Cuzzolin, F., Olmo, J., Terrados, N., et al. Strategies and solutions for team sports athletes in isolation due to COVID-19. Sports, 2020; 8(4):56.
16. Anderson, R. M., Heesterbeek, H., Klinkenberg, D., Hollingsworth, T. D. How will country-based mitigation measures influence the course of the COVID-19 epidemic? The Lancet, 2020; 395(10228): 931-934.
17. Mann, R.H., Clift, B.C., Boykoff, J., Bekker, S. Athletes as community; athletes incommunity: Covid-19, sporting mega-events and athlete health protection. British J of Sports Medicine. 2020; 54(18);1071-172.
18. Koçak, U., & Kaya, Ö. D. COVID-19 pandemisi, spor, sporcu üçgeni: etkilenimler ve öneriler. İzmir Kâtip Çelebi Üniversitesi Sağlık Bilimleri Fakültesi Dergisi, 2020; 5 (2): 129-133.
19. Şahin, M. COVID-19 salgını spor ekonomisini derinden etkiledi, Published on: 19 Mayıs 2020, https://iste.edu.tr/haber-merkezi/2020/05/17/1041 adresinden alınmıştır. (Erişim tarihi; 20.03-2021).
20. Demirci, N. Fight Coronavirus Disease (COVID-19): More active people for a healthier world: physical activity recommendations Int J of Disabilities Sports & Health Science, 2020: 3(1); 1-4.
21. Rhodes, R. E., Janssen, I, Bredin S.S.D., Warburton, E.R.D. Bauman, A. Physical activity: Health impact, prevalence, correlates and interventions. Psychology & Health, 2017: 32(8): 942-975.
22. Pedersen, B. K., Saltin, B. Exercise as medicine– evidence for prescribing exercise astherapy in 26 different chronic diseases. Scandinavian J of Medicine & Science in Sports, 2015; 25(3): 1–72.
23. Powell, K. E., Paluch, A. E., Blair, S. N. Physicalactivity for health: What kind? How much? How intense? On top of what? Annual Review of Public Health, 2011; 32(1): 349–365.
24. Chekroud, S. R., Gueorguieva, R., Zheutlin, A. B., Paulus, M., Krumholz, H. M., Krystal, J. H., Chekroud, A. M. Association between physical exercise and mental health in 1·2 million individuals in the USA between 2011 and 2015: A cross-sectional study. The Lancet Psychiatry, 2018; 5(9): 739–746.
25. Mathieu, R. A., Powell-Wiley, T. M., Ayers, C. R., McGuire, D. K., Khera, A., Das, S. R., Lakoski, S. G. Physical activity participation, health perceptions, and cardiovascular disease mortality in a multiethnic population: The Dallas heart study. American Heart J, 2012; 163(6): 1037–1040.
26. Demiray, H. [İnternet]. Korona virüsün spor sektörüne getirdiği maliyetler [cited 2020 Oct 22]. Avaliable from: https://www.aa.com.tr/tr/spor/spor-futuristi-demiray-koronavirus-spor-sektorune-ciddi-maliyet-getirecek/1841114
27. Bradford, J. [İnternet]. COVID- 19 impact on sport [cited 2020 Oct 22]. Avaliable from: https://www.mediacom.com/uk/article/index?id=covid-19-impact-on-sport
28. Evans, A.B., Blackwell, J., Dolan, P., Fahlén, J., Hoekman, R., Lenneis, V., McNarry, G., Smith, M.,Wilcock, L. Sport in the face of the COVID-19 pandemic: Towards an agenda for research in the sociology of sport. European J for Sportand Society, 2020; 17(2): 85-95.
29. Huang, Y., Zhao, N. Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 epidemic in China: A web-based cross-sectional survey. medRxiv. 2020; 288:11954.
30. Taub, A. [İnternet]. A new Covid-19 crisis: Domestic abuse rises World wide. New York Times, 6. sayı –no sayfa [cited 2021 Apr. 02]. Avaliable from: https://www.nytimes.com/2020/04/06/world/coronavirus-domestic-violence.html
31. Oosterhoff, B., palmer, C., Wilson, J., & Shook, N. Adolescents' Motivations to Engage in Social Distancing during the COVID-19 Pandemic: Associations with Mental and Social Health. 2020; 67(2):179-185.
32. Papaioannou, A.G., Schinke, R.J., Chang, Y.K., Kim, YH.H., Duda, J.L. Physical activity, health and well-being in an imposed social distanced world, Int J of Sport and Exercise Psychology, 2020; 18(4): 414-419.

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Current Trends of Creatine Use in Exercise: A Systematic Review

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Abstract

Creatine, which is a popular ergogenic aid, is shown among the most effective methods used as a performance enhancer in athletes. The aim of this review is to summarize the current publications to show the uses and effects of creatine in exercise. In the present study prepared in a systematic review style, full-text articles about creatine use published in Science Citation Index (SCI), SCI-Expanded, and PubMed/MEDLINE databases' journals between 2010 and 2021 were examined. The searching was performed by "creatine", "creatine monohydrate" and "creatine supplementation" keywords. Data from 46 studies showed that creatine loading in individuals who train during high intensity and short term exercise forms affect performance positively, develop muscle mass/strength and increase muscle creatine phosphate (PCr) stores. It was also found that creatine supplement applied with strength training in elderly individuals increased muscle mass, muscle strength, and movement capacity. It is determined that there is no definitive and clear procedure regarding the usage dosage for creatine. In addition, though some studies have reported that creatine use has a positive effect on cognitive performance, a definite judgment has not been reached. Consequently, it has been demonstrated that creatine supplementation is an effective ergogenic aid for the development of muscle and strength for athletes of all levels. The increase in the number of studies on the creatine usage dosage to be examined in different athlete profiles may lead to a decrease in the contradictions about the usage procedure.

Key Words: Athletic performance, creatine, ergogenic aid, supplement

Özet

Popüler bir ergojenik yardım ürünü olan kreatin, uzun yıllardır sporcularda performans artırıcı olarak kullanılan en etkili yöntemler arasında gösterilmektedir. Bu derleme çalışmasının amacı; 2010-2021 yılları arasında gerçekleştirilen güncel yayınları inceleyerek, kreatinin egzersizdeki kullanımı ve etkilerini ortaya koymaktır. Sistematik derleme tarzında hazırlanan çalışmada, kreatinin son yıllarda hangi amaçla / ne şekilde kullanıldığı ve güncel eğilimlerin belirlenmesi için, Science Citation Index (SCI), SCI-Expanded ve PubMed/MEDLINE veri tabanlarındaki dergilerde 2010-2021 yılları arasında yayınlanmış tam metin makaleler (İngilizce) incelenmiştir. "Creatine, "creatine monohydrate" ve "creatine supplementation", araştırmalar yapılırken çoğunlukla kullanılan anahtar kelimelerdir. Belirtilen şartları sağlayan makalelerdeki bulgulara göre; yüksek şiddetli ve kısa süreli formlarda gerçekleştirilen antrenmanlarda kreatin yüklemesinin, atletik performansı olumlu yönde etkilediği, kas kütlesi/kuvvetini geliştirdiği ve kas kreatin fosfat (PCr) depolarını arttırdığı tespit edilmiştir. Yaşlı bireylerde kuvvet antrenmanları ile birlikte uygulanan kreatin takviyesinin de kas kütlesi, kas kuvveti ve hareket kapasitesini arttırdığı görülmüştür. Kullanım dozu ile ilgili ise standart bir prosedür olmadığı belirlenmiştir. Ayıca bazı çalışmalarda kreatin kullanımın bilişsel performansa pozitif etki ettiği bildirilse de kesin bir yargıya varılamamıştır. Sonuç olarak kreatin takviyesinin her seviyeden sporcu için kas ve kuvvetin gelişiminde etkili bir ergojenik madde olduğu ortaya koyulmuştur. Farklı sporcu profillerinde incelenecek olan kreatin kullanım dozu ile ilgili çalışma sayısının artmasının, kullanım prosedürü hakkında oluşan çelişkilerin azalmasına yol açabileceği düşünülmektedir.

Anahtar Kelimeler: Ergojenik yardım, kreatin, atletik performans, suplement

INTRODUCTION

Ergogenic aids are defined as a pharmacological method or psychological technique that can increase exercise performance (41). In recent years, many athletes have used ergogenic aids to maintain fitness level, enhancing recovery and physiological adaptations during long-term training periods. So, the efficacy of ergogenic aids has always attracted great attention, and many researchers have sought to combine ergogenic aid and exercise training programs to strengthen the benefits of training (65). Creatine, which is an ergogenic aid, is shown among the most effective methods used as a performance (strength) enhancer in athletes (17, 30, 44, 63, 68). Creatine, whose performance has been increasing continuously since the 1990s, is more effective especially when used with exercises performed in high intensity and short-term forms. For this reason, it is frequently preferred by individuals who participate in strength and fitness training both as professionals and as amateurs (9).

Creatine is a natural and nitrogen containing amino acid compound which is found mainly in red meat and sea products and it plays a role in protein synthesis (32). It is produced endogenously 1 g per day in liver and kidneys and less than 1 g in pancreas (20). It can also be taken into the body through food synthesized from essential and non-essential amino acids (33). Although creatine is mostly found in skeletal muscles (95%) in the body, it is also found in certain amounts (5%) in the brain and testicles (43). Although it has different types structurally, the most widely used and preferred type of creatine is creatine monohydrate (CrM) (37). The primary effect of CrM is to increase muscle creatine stores during exercise (40). It is also known to increase exercise capacity, endurance and muscle mass in addition to having a positive effect on bone mineral density (BMD), muscle damage and recovery (5, 25, 36).

Creatine supplement has many ergogenic properties such as muscle recovery, increased protein synthesis and energy storage in the form of creatine phosphate (PCr) (36). Using appropriate dose of creatine, which acts as an energy substrate, for contraction in skeletal muscle increases the usability of Adenosine 3'-triphospate (ATP) especially in high intensity/short term exercise lasting 30 seconds or shorter by increasing PCr muscle storage (20). The main purpose of creatine supplementation is to delay fatigue for a short time in order to increase performance and to increase resting PCr levels and free creatine level (9). While short-term creatine supplement increases PCr stores by 10%-40%, an increase of 10% - 30% occurs in total creatine (52).

In general, creatine use (mostly CrM) is not recommended by American College of Sports Medicine (ACSM) due to possible health problems such as liver/kidney failure, dehydration and cramp (62). Considering that CrM is commonly used especially in individuals who exercise as an amateur, when not used in proper dosage, negative effects (side effects) as well as positive effects can be seen in most of the supplements (8). However, despite all these potential side effects, it was found that CrM supplement did not have negative effects on liver and kidney functions in healthy individuals; CrM supplement was even found to prevent cramp and dehydration during exercise under adverse environmental conditions (15).

The aim of this study is to review current publications between 2010 and 2021 to show the uses and effects of creatine in exercise. The aim is to guide athletes/trainers in terms of usage methods of creatine, which is a popular supplement, and to give ideas in the design of scientific studies to be carried out with the results presented in the study.

MATERIAL AND METHOD

The study was prepared in a systematic review format. Basically, answers were sought to questions such as the development of creatine in recent years, what purposes it is used for, timing of use and what the recommended daily use should be. In order to reach the answers to these questions, a comprehensive research was carried out by examining the full text articles (English) published between 2010 and 2021 on creatine use in Science Citation Index (SCI), SCI-Expanded and PubMed/MEDLINE databases. “Creatine”, “creatine monohydrate” and “creatine supplementation” are the key words used while searching.

After “title” and “abstract” parts were examined respectively, the findings related to the research questions, and the conditions for including information about the aim and procedure of creatine use were sought. While reviewing the studies, no restrictions were applied on classifications such as review, meta-analysis, research article or variables such as sport branch, type of exercise and gender.

As a result, a total of 46 articles which met the specified conditions were examined (Figure 1).

Ethical approval was not required for this systematic review.

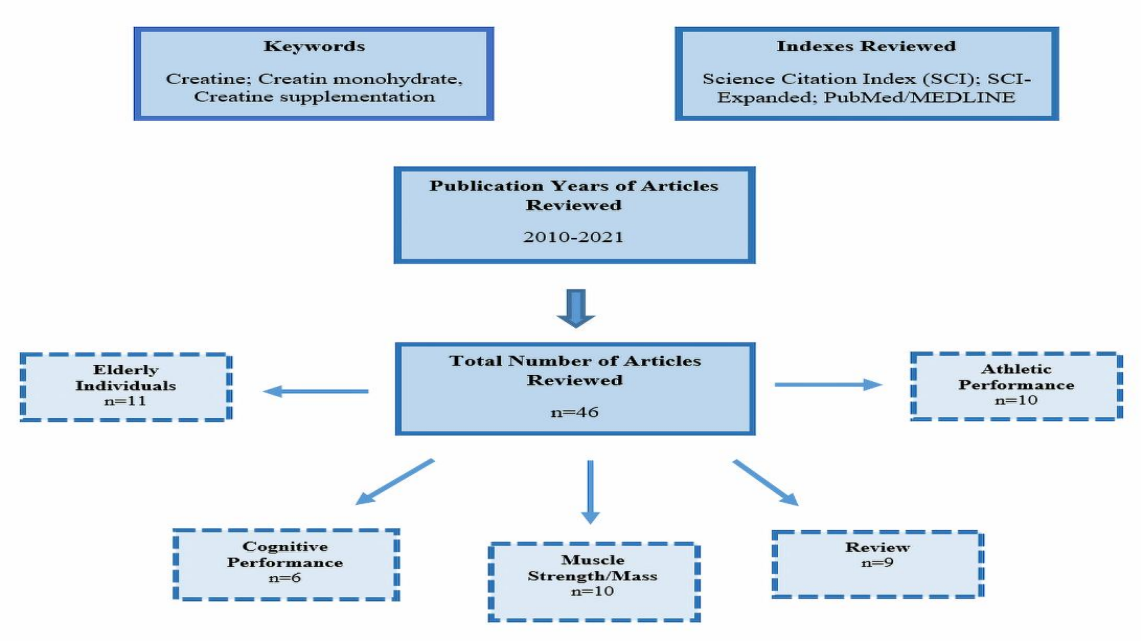

Figure 1. Chart of study selection

RESULTS

A total of 46 full text articles which met the specified conditions were examined. In the articles reviewed, it was found that the widespread use of creatine continues today and the number of scientific studies on the subject is gradually increasing. Important findings were reached regarding for what purposes creatine has been used in recent years, the effects of creatine on athletic/cognitive performance and muscle strength/mass and its use in elderly individuals.

It was found that creatine loading in individuals who train during high intensity and short term exercise forms affect performance positively, develop muscle mass/strength and increase muscle PCr stores. It was also found that creatine supplement applied with strength training in elderly individuals increased muscle mass, muscle strength and movement capacity, while no changes were observed regarding BMD. However, although there is no definitive and clear procedure as the usage dosage for creatine supplement, many studies have shown that continuing routine daily creatine intake (0.03 g/kg/day or average 5 g.) after creatine loading (0.3 g/kg/ day or average 20 g) applied in the first 5-6 days is an effective method. Although there are limited number of studies examining the long-term use of creatine, existing studies have emphasized the need to be careful about this issue (especially with continuous use for a year) and that its short term use is safer in terms of health.

Some of the findings from reviewed studies are shown in Table 1.

Table 1. Some examples of studies on the use of creatine in exercise

Study	Subjects	Creatine Procedure	Summary of findings
Hammet et al. (31) (2010)	22 healthy individuals Cr n=11 Pla n=11	Creatine 20 g / day in 2 equally divided doses for 5 days and 5 g creatine once daily for the next 2 additional days	Increased cognitive performance
Mohebbi et al. (51) (2012)	17 Football players (age: 17.18 years) Cr n=8 Pla n=9	5 g of creatine, 4 doses per day for 1 week	Changing in positive way in repetitive sprinting and dribbling skills
Gualano et al. (29) (2014)	Age ≥ 60 women Pla n=15 Cr n= 15 Pla+RT n=15 Cr+RT n=15	Creatine 20 g / day, divided into four doses for the first 5 days; 5 g doses per day (during lunch) for the following 23 weeks	Improvement in muscle strength and muscle function in the elderly individuals. No change in BMD.
Candow et al. (14) (2014)	Adults aged 50-64 Pla n=11 Cr-Pre Training n=11 Cr-Post Training n=11	Creatine taking on training days only	Increase in muscle mass. No difference between the creatine groups.
Campillo et al. (57) (2015)	33 amateur women football players Pla n=10 Cr n=10 C n=10	5 g creatine 4 times a day for 5 days followed by 5 g creatine daily for 5 weeks (at lunch)	Improvement in repetitive sprinting and jumping performance. No change in endurance performance.
Turner et al. (64) (2015)	15 healthy individuals (age: 31years) Cr n=8 Pla n=7	4 doses of 5 g of creatine per day for 1 week.	Increase in neural creatine level. Decrease in attention disorders at the time of hypoxia
Pinto et al. (55) (2016)	Healthy, untrained women and men aged 60-80 Cr + RT n=13 Pla + RT n=14	5 g creatine daily After lunch on rest days	Increase in muscle mass.
Merege-Filho et al. (48) (2016)	67 healthy children (aged 10-12) Pla n=32 Cr n=35	0.3 g.kg-1 per day	No change in neural creatine level and cognitive performance
Wang et al. 65) (2018)	Baseball, basketball and tchoukball players Pla n=15 Cr n=15	0.3g / kg creatine 4 times a day for 6 days. 2 g of creatine during training and 2 g after training	Increase in muscle strength.

Pla: Placebo Group; Cr: Creatine Group; Cr + RT: creatine + resistance training group; Pla + RT: Placebo + Resistance training group; C: Control Group

DISCUSSION

Creatine is shown among the most effective and popular methods used as a performance enhancer in athletes. The present review examined current studies conducted on the use of creatine in exercise. The results of the present study revealed that creatine loading affect athletic performance positively especially during high intensity exercise forms. It was also found that creatine supplement could be useful for elderly individuals to increase muscle mass and movement capacity. It is determined that there is no clear procedure regarding the usage dosage for creatine. Reviewed studies and the results were discussed under different headings.

Creatine and Muscle Strength /Mass

There are many studies which show that creatine, which is frequently preferred by athletes of all levels among ergogenic aids, increases muscle strength when used during strength training (3, 10, 20, 50, 67, 68). When studies recently conducted are examined, it was found that Nunes et al. (54) found that 8-week long creatine loading during strength training (first week 4 doses of 0.3 g/kg; 7 weeks single dose of 0.03 g/kg) increased muscle strength significantly when compared with the placebo group. In their study, Wang et al. (65) found that strength training with 4- week long creatine supplement (4 doses of 5 g in the first six days; a total of 4 g, 2 g before and after 3-week long training) affected muscle strength positively. The results of Kaviani et al. (39) are similar. In a different

study by Claudino et al. (17) on football players, 7-week long creatine loading (first week 4 doses of 5 g; daily 5 g for the remaining 6 weeks) affected lower extremity strength statistically positively. Candow et al. (12) reported that different doses of creatine loading (low dose group: 0.10 g/kg 3 days a week; high dose group: 0.15 g/kg) increased strength when compared with the placebo group. However, no difference was found between the doses applied.

As a result, it can be seen clearly that when applied within the doses in literature, creatine loading develops muscle strength and power. The reason for this is the increase in muscle creatine phosphate stores during creatine loading period and the positive effect on performance as a result of faster ATP resynthesis between sets during training. Therefore, it is thought that creatine supplement is an important method for strength development.

Creatine and Athletic Performance

Combined application of aerobic and anaerobic exercises in team sports are considered as indispensable in terms of the development of strength and endurance. The use of creatine supplement for fatigue caused by long-term aerobic exercise in order not to affect athletes' performance is a subject that has been investigated in literature (22) because it is thought that as a result of the increase in muscle Pcr with creatine supplement, activities connected to energy system may be affected by this process (40). Results of studies on the subject have shown that creatine use causes different (inconsistent) results in athletes (28,44, 45, 53, 60,66).

In their study, Hickner et al. (35) examined the effects of 28-day creatine supplement applied to 12 cyclists (creatine and placebo group) on exercise performance. As a result, it was found that creatine loading applied as a single dose daily (3 g) with dinner for 28 days did not affect sprint performance. Forbes et al. (26) examined the effects of high intensity interval training (HIIT) applied with 4–week long creatine supplement on physical performance. According to the results of the study, it was found that creatine supplement for HIIT training did not have an effect on cardiorespiratory fitness and performance and body composition. In their study conducted on 30 amateur female football players (placebo, n=10; creatine, n=10, control, n=10).

Campillo et al. (57) examined the effects of creatine supplement applied with 6-week long plyometric training on aerobic and anaerobic performance. As a result of the study, although no statistically significant difference was found between the creatine and placebo group in terms of endurance performance, a positive difference was found in the creatine group in jumping and repeated sprint tests. Similarly, in a study they examined the effects of creatine supplement on sprint and sportive performance in young football players (creatine and placebo group), Mohebbi et al. (51) found that using daily 4 doses (breakfast, lunch, dinner and before sleep) for 1 week in the creatine group developed repeated sprint and dribbling performance more statistically when compared with the placebo group. Crisafulli et al. (21) also found similar results. In a review conducted by Mielgo-Ayuso et al. (49), it was reported that creatine supplement in football players increased intramuscular creatine concentrations and supported ATP-PC energy system.

Different results can be seen in studies conducted on the effects of creatine use on athletic performance. Despite contradictory results, it is thought that creatine use may cause increase in high intensity exercise performance. However, while interpreting the effects of creatine use on athletic performance, how energy systems are used and the type of exercise should be specified clearly.

Creatine and Cognitive Performance

Based on the fact that creatine use shows development in athletic and sportive performance, the effects of creatine use in athletes, sedentary, elderly individuals and some patient population is an area researched in literature (34,56, 58,59). Contradictory results have been found in studies conducted on the use of creatine (2, 18, 31, 56). Turner et al. (64) examined the effects of creatine supplement during acute lack of oxygen in young adults on neurophysiological and neuropsychological functions. As a result, it was found that creatine supplement increased neural creatine level and prevented attention disorders that occurred during lack of oxygen. Merege-Filho et al. (48) found that 1-week long creatine supplement (0.3 g.kg-1 per day) did not have any effects on brain creatine level and cognitive abilities. In a review by Dolan et al. (24), it was stated that creatine supplement increased brain creatine level and caused improvement in cognitive peformance; however, it was emphasized that the number of studies was not sufficient to verify this thesis. It was

also reported that there is no precise creatine loading procedure in increasing brain creatine level.

It is an accepted fact that regular exercise improves brain health and cognitive performance. In this context, the judgement that creatine use increases athletic and sportive performance is seen as a process that is not completely clear for cognitive performance.

Creatine Use in Elderly Individuals

Aging is a process characterized by morphological, functional and biochemical changes in the human body, including the muscoskeletal system. This process also includes the loss of muscle and bone mass along with muscle strength (4). Loss of muscle mass and decrease in muscle performance due to aging has a negative influence on physical functions while also reducing performing daily life activities (47). For this reason, various strategies are recommended to prevent the progression of these negative effects in elderly individuals. Among these strategies, the use of creatine comes to the fore with strength training (46).

Studies on the subject show that creatine supplement with strength training has positive effects on muscle mass and strength in elderly individuals (1, 6, 7, 10,16, 19, 27, 38). Gualano et al. (29) examined the effects of creatine supplement with 24-week long strength training on muscle strength/function and bone mass in elderly women (≥ 60 years). The participants were grouped in four as creatine group (Cr: n=15), creatine + strength training (Cr+RT: n=15), placebo group (Pla: n=15) and placebo + strength training group (Pla+RT: n=15). As a result, it was found that Cr+RT group showed more improvement in muscle strength and muscle function parameters when compared with the other groups. No change was found in bone mass. In their study they examined the effects of pre-exercise and post-exercise creatine intake with strength training on muscle strength in elderly individuals, Candow et al. (14) found that both pre-exercise and post-exercise creatine use caused improvement in muscle strength when compared with the placebo group. No difference was found between the groups in terms of the time of creatine use. Similar results were found in a study conducted by Candow et al. (13). Pinto et al. (55) examined the effects of low dose creatine (single dose of 5 g) with strength training (12 weeks, 3 days a week) on muscle mass, strength and bone mass in elderly individuals. As a result of the study, it was found that creatine group showed more improvement than the placebo group in terms of strength, while no change was found in bone mass.

The results of studies examined showed that the use of creatine in elderly individuals had a positive effect on strength development. This situation proves the importance of using creatine in elderly individuals in order to maintain mobility, balance and daily life activities and to increase the quality of life in general especially with advancing age. Similarly, Stares and Bains (61) stated that creatine use was safe in elderly individuals and the use of creatine with especially moderate and high intensity strength training increased muscle strength and mass in elderly individuals. Further studies are needed for clearer findings on bone mass and BMD.

Creatine Loading and Usage Dose

Although there are a large number of studies which show that creatine improved muscle strength and athletic performance, it can be seen that there is no definitive judgment about the dosage of use. In their meta-analysis, Devries and Phillips (23) reported that daily 0.07 g.kg-1 or 5 g creatine use with strength training showed positive results in increasing muscle mass and strength. In their review, Kim et al. (42) stated that the fastest method in maximizing muscle creatine stores is daily single dose of 0.3 g.kg-1 creatine for 5-7 days. In their review, Hall and Troijnan (30) stated that optimum creatine procedure is daily single dose of 0.3 g.kg-1 the first 5-7 days and daily single dose of 0.03 g.kg-1 the following 4-6 weeks. Cooper et al. (20) stated that ideal creatine loading procedure should consist of "loading (daily 4 doses of 29 g creatine the first 5-7 days)" and "care (daily single dose of 5 g)" phases. In a review which researched the issue of loading and maintenance phases, Mielgo-Alusa et al. (49) found that 9-week long daily single dose of 5 g maintenance care phase application following a total of 20 g creatine loading phase with daily 3-4 doses during the first 6-7 days in football players has a positive effect on anaerobic strength.

In general, it was concluded that daily 5 g of creatine use is a common use following the loading period. However, considering that there are a large number of studies on creatine, which still keeps its popularity for all levels of athletes as an ergogenic aid, the fact that there is no clear procedure about its usage dose comes to the fore as an issue that should be emphasized.

CONCLUSION

Considering that the use of ergogenic aids and athlete food is increasing and becoming widespread, the importance of up-to-date results on creatine, which is a popular product, is also increasing. In the light of the findings in reviewed studies, it can be said that creatine use has a positive effect on the increase in muscle creatine phosphate stores and especially on muscle strength/mass and athletic performance. However, the effect of creatine on cognitive performance is not clear. Although there is a widespread use about its dose (daily 5 g), it is a fact that there is still no clear usage procedure.

Although creatine is widely used in athletes and individuals who exercise regularly, the present study shows its use and effects in elderly individuals also. While no relationships is found between bone health and intensity and creatine use in terms of preventing osteoporosis, which is a systemic metabolic bone disease causing a tendency for fractures in elderly individuals, it has been concluded that creatine use has a positive effect on strength development in elderly individuals in terms of the ability to move.

As a conclusion, an increase in the number of studies relating the creatine usage dose to be examined in different athlete profiles will cause a decrease in the contradictions about how and in what dosage creatine, which appeals to a high population, should be used. In this direction, it is thought that possible side effects of creatine use and negative situations that may occur depending on its usage period can be shown clearly.

REFERENCES

1. Aguiar AF, Januário RSB, Junior RP, Gerage AM, Pina FLC, Do Nascimento MA, Cyrino ES. Long-term creatine supplementation improves muscular performance during resistance training in older women. European Journal of Applied Physiology, 2013; 113(4), 987-996.
2. Alves CRR, Merege Filho CAA, Benatti FB, Brucki S, Pereira RMR, de Sá Pinto AL, Gualano, B. Creatine supplementation associated or not with strength training upon emotional and cognitive measures in older women: a randomized double-blind study. PLoS One, 2013; 8(10), e76301.
3. Antonio J, Ciccone V. The effects of pre versus post workout supplementation of creatine monohydrate on body composition and strength. Journal of the International Society of Sports Nutrition, 2013; 10(1), 1-8.
4. Araújo AP, Bertolini SMMG, Junior JM. Morphophysiologial alterations resulted from the process of musculoskeletal system aging and its consequences for the human body. Perspectivas: Biológicas e Saúde, 2014; 4, 22-34.
5. Bassit RA, da Justa Pinheiro CH, Vitzel KF, Sproesser AJ, Silveira LR, Curi R. Effect of short-term creatine supplementation on markers of skeletal muscle damage after strenuous contractile activity. European Journal of Applied Physiology, 2010; 108(5), 945-955.
6. Bemben MG, Witten MS, Carter JM, Eliot KA, Knehans AW, Bemben DA. The effects of supplementation with creatine and protein on muscle strength following a traditional resistance training program in middle-aged and older men. The Journal of Nutrition, Health & Aging, 2010; 14(2), 155-159.
7. Bernat P, Candow DG, Gryzb K, Butchart S, Schoenfeld BJ, Bruno P. Effects of high-velocity resistance training and creatine supplementation in untrained healthy aging males. Applied Physiology, Nutrition, and Metabolism, 2019; 44(11), 1246-1253.
8. Bishop, D. Dietary supplements and team-sport performance. Sports Medicine, 2010; 40(12), 995-1017.
9. Butts J, Jacobs B, Silvis M. Creatine use in sports. Sports Health, 2018; 10(1), 31-34.
10. Camic CL, Hendrix CR, Housh TJ, Zuniga JM, Mielke M, Johnson GO, Housh DJ. The effects of polyethylene glycosylated creatine supplementation on muscular strength and power. The Journal of Strength & Conditioning Research, 2010; 24(12), 3343-3351.
11. Camic CL, Housh TJ, Zuniga JM, Traylor DA, Bergstrom HC, Schmidt RJ, Housh DJ. The effects of polyethylene glycosylated creatine supplementation on anaerobic performance measures and body composition. The Journal of Strength & Conditioning Research, 2014; 28(3), 825-833.
12. Candow DG, Chilibeck PD, Burke DG, Mueller KD, Lewis JD. Effect of different frequencies of creatine supplementation on muscle size and strength in young adults. The Journal of Strength & Conditioning Research, 2011; 25(7), 1831-1838.
13. Candow DG, Vogt E, Johannsmeyer S, Forbes SC, Farthing JP. Strategic creatine supplementation and resistance training in healthy older adults. Applied Physiology, Nutrition, and Metabolism, 2015; 40(7), 689-694.
14. Candow DG, Zello GA, Ling B, Farthing JP, Chilibeck PD, McLeod K, Johnson S. Comparison of creatine supplementation before versus after supervised resistance training in healthy older adults. Research in Sports Medicine, 2014; 22(1), 61-74.
15. Carvalho APPF, Molina GE, Fontana KE. Creatine supplementation associated with resistance training does not alter renal and hepatic functions. Revista Brasileira de Medicina do Esporte, 2011; 17(4), 237-241
16. Chilibeck PD, Candow DG, Landeryou T, Kaviani M, Paus-Jenssen L. Effects of creatine and resistance training on bone health in postmenopausal women. Medicine & Science in Sports & Exercise, 2015; 47(8), 1587-1595.
17. Claudino JG, Mezêncio B, Amaral S, Zanetti V, Benatti F, Roschel H, Serrão JC. Creatine monohydrate supplementation on lower-limb muscle power in Brazilian elite soccer players. Journal of the İnternational Society of Sports Nutrition, 2014; 11(1), 1-6.
18. Cook CJ, Crewther BT, Kilduff LP, Drawer S, Gaviglio CM. Skill execution and sleep deprivation: effects of acute caffeine or creatine supplementation-a randomized placebo-controlled trial. Journal of The İnternational Society of Sports Nutrition, 2011; 8(1), 1-8.
19. Cooke MB, Brabham B, Buford TW, Shelmadine BD, McPheeters M, Hudson, GM, Willoughby DS. Creatine supplementation post-exercise does not enhance training-induced adaptations in middle to older aged males. European Journal of Applied Physiology, 2014; 114(6), 1321-1332.
20. Cooper R, Naclerio F, Allgrove J, Jimenez A. Creatine supplementation with specific view to exercise/sports

performance: an update. Journal of the International Society of Sports Nutrition, 2012; 9(1), 1-11.
21. Crisafulli DL, Buddhadev HH, Brilla LR, Chalmers GR, Suprak DN, San Juan JG. Creatine-electrolyte supplementation improves repeated sprint cycling performance: A double blind randomized control study. Journal of the International Society of Sports Nutrition, 2018; 15(1), 1-11.
22. de Salles Painelli V, Alves VT, Ugrinowitsch, C., Benatti, F. B., Artioli, G. G., Lancha, AH, Roschel, H. Creatine supplementation prevents acute strength loss induced by concurrent exercise. European Journal of Applied Physiology, 2014; 114(8), 1749-1755.
23. Devries MC, Phillips SM. Creatine supplementation during resistance training in older adults—a meta-analysis. Medicine & Science in Sports & Exercise, 2014; 46(6), 1194-1203
24. Dolan E, Gualano B, Rawson ES. Beyond muscle: the effects of creatine supplementation on brain creatine, cognitive processing, and traumatic brain injury. European Journal of Sport Science, 2019; 19(1), 1-14.
25. Fernández-Landa J, Calleja-González J, León-Guereño P, Caballero-García A, Córdova A, Mielgo-Ayuso J. Effect of the combination of creatine monohydrate plus HMB supplementation on sports performance, body composition, markers of muscle damage and hormone status: A systematic review. Nutrients, 2019; 11(10), 2528.
26. Forbes SC, Sletten N, Durrer C, Myette-Côté É, Candow D, Little JP. Creatine monohydrate supplementation does not augment fitness, performance, or body composition adaptations in response to four weeks of high-intensity interval training in young females. International Journal of Sport Nutrition and Exercise Metabolism, 2017; 27(3), 285-292.
27. Forbes SC, Chilibeck PD, Candow DG. Creatine supplementation during resistance training does not lead to greater bone mineral density in older humans: a brief meta-analysis. Frontiers in Nutrition, 2018; 5, 27.
28. Fukuda DH, Smith AE, Kendall KL, Dwyer TR, Kerksick CM, Beck TW, Stout JR. The effects of creatine loading and gender on anaerobic running capacity. The Journal of Strength & Conditioning Research, 2010; 24(7), 1826-1833.
29. Gualano B, Macedo AR, Alves CRR, Roschel H, Benatti FB, Takayama L, Pereira R MR. Creatine supplementation and resistance training in vulnerable older women: a randomized double-blind placebo-controlled clinical trial. Experimental Gerontology, 2014; 53, 7-15.
30. Hall M, Trojian T H. Creatine supplementation. Current Sports Medicine Reports, 2013; 12(4), 240-244.
31. Hammett ST, Wall MB, Edwards TC, Smith, AT. Dietary supplementation of creatine monohydrate reduces the human fMRI BOLD signal. Neuroscience Letters, 2010; 479(3), 201-205.
32. Harris R. Creatine in health, medicine and sport: an introduction to a meeting held at Downing College, University of Cambridge, July 2010. Amino Acids, 2011; 40:1267–1270
33. Havenetidis K. The use of creatine supplements in the military. BMJ Military Health, 2016; 162(4), 242-248.
34. Heaton LE, Davis JK, Rawson ES, Nuccio RP, Witard OC, Stein KW, Baker LB. Selected in-season nutritional strategies to enhance recovery for team sport athletes: a practical overview. Sports Medicine, 2017; 47(11), 2201-2218.
35. Hickner RC, Dyck DJ, Sklar J, Hatley H, Byrd P. Effect of 28 days of creatine ingestion on muscle metabolism and performance of a simulated cycling road race. Journal of the International Society of Sports Nutrition, 2010; 7(1), 1-13.
36. Jäger R, Purpura M, Shao A, Inoue T, Kreider RB. Analysis of the efficacy, safety, and regulatory status of novel forms of creatine. Amino acids, 2011; 40(5), 1369-1383.
37. Jagim AR, Oliver JM, Sanchez A, Galvan E, Fluckey J, Riechman S, Kreider RBA. Buffered form of creatine does not promote greater changes in muscle creatine content, body composition, or training adaptations than creatine monohydrate. Journal of the International Society of Sports Nutrition, 2012; 9(1), 1-18.
38. Johannsmeyer S, Candow DG, Brahms CM, Michel D, Zello GA. Effect of creatine supplementation and drop-set resistance training in untrained aging adults. Experimental Gerontology, 2016; 83, 112-119.
39. Kaviani M, Abassi A, Chilibeck PD. Creatine monohydrate supplementation during eight weeks of progressive resistance training increases strength in as little as two weeks without reducing markers of muscle damage. The Journal of Sports Medicine and Physical Fitness, 2018; 59(4), 608-612.
40. Kerksick CM, Arent S, Schoenfeld BJ, Stout JR, Campbell B, Wilborn CD, Antonio J. International society of sports nutrition position stand: nutrient timing. Journal of the International Society of Sports Nutrition, 2017; 14(1), 1-21.
41. Kerksick CM, Wilborn CD, Roberts MD, Smith-Ryan A, Kleiner SM, Jäger R, Kreider RB. ISSN exercise & sports nutrition review update: research & recommendations. Journal of the International Society of Sports Nutrition, 2018; 15(1), 1-57.
42. Kim J, Lee J, Kim S, Yoon D, Kim J, Sung DJ. Role of creatine supplementation in exercise-induced muscle damage: a mini review. Journal of Exercise Rehabilitation, 2015; 11(5), 244.
43. Kreider RB, Jung YP. Invite review: creatine supplementation in exercise, sport, and medicine. Journal of Exercise Nutrition & Biochemistry, 2011; 15(2), 53-69.
44. Kreider RB, Kalman DS, Antonio J, Ziegenfuss TN, Wildman R, Collins R, Lopez H L. International Society of Sports Nutrition position stand: safety and efficacy of creatine supplementation in exercise, sport, and medicine. Journal of the International Society of Sports Nutrition, 2017; 14(1), 1-18.
45. Lamontagne-Lacasse M, Goulet ED. Effect of Creatine Supplementation on Jumping Performance In Highly-Trained Volleyball Players: A Pilot Study: 1917Board# 46 June 3 8: 00 AM-9: 30 AM. Medicine & Science in Sports & Exercise, 2010; 42(5), 444.
46. Lobo DM, Tritto AC, da Silva LR, de Oliveira PB, Benatti FB, Roschel H, Pereira R MR. Effects of long-term low-dose dietary creatine supplementation in older women. Experimental Gerontology, 2015; 70, 97-104.
47. Manini TM, Clark BC. What we have learned from exercise and lifestyle trials to alleviate mobility impairment in older adults. The Journal of Frailty & Aging, 2013; 2(1), 57
48. Merege-Filho CAA, Otaduy MCG, de Sá-Pinto AL, de Oliveira MO, de Souza Gonçalves L, Hayashi APT, Gualano B. Does brain creatine content rely on exogenous creatine in healthy youth? A proof-of-principle study. Applied Physiology, Nutrition, and Metabolism, 2017; 42(2), 128-134.
49. Mielgo-Ayuso J, Calleja-Gonzalez J, Marqués-Jiménez D, Caballero-García A, Córdova A, Fernández-Lázaro D. Effects of creatine supplementation on athletic performance in soccer players: A systematic review and meta-analysis. Nutrients, 2019; 11(4), 757.
50. Mills S, Candow DG, Forbes SC, Neary JP, Ormsbee MJ, Antonio J. Effects of Creatine Supplementation during Resistance Training Sessions in Physically Active Young Adults. Nutrients, 2020; 12(6), 1880.
51. Mohebbi H, Rahnama N, Moghadassi M, Ranjbar K. Effect of creatine supplementation on sprint and skill performance in

Young Soccer Players. Middle-East Journal of Scientific Research, 2012; 12(3), 397-401.
52. Momaya A, Fawal M, Estes R. Performance-enhancing substances in sports: a review of the literature. Sports Medicine, 2015; 45(4), 517-531.
53. Nemezio KMDA, Bertuzzi R, Correia-Oliveira CR, Gualano B, Bishop DJ, Lima-Silva AE. Effect of creatine loading on oxygen uptake during a 1-km cycling time trial. Medicine & Science in Sports & Exercise, 2015; 47(12), 2660-2668.
54. Nunes JP, Ribeiro AS, Schoenfeld BJ, Tomeleri CM, Avelar A, Trindade MC, Cyrino ES. Creatine supplementation elicits greater muscle hypertrophy in upper than lower limbs and trunk in resistance-trained men. Nutrition and health, 2017; 23(4), 223-229.
55. Pinto CL, Botelho PB, Carneiro JA, Mota JF. Impact of creatine supplementation in combination with resistance training on lean mass in the elderly. Journal of Cachexia, Sarcopenia And Muscle, 2016; 7(4), 413-421.
56. Rae CD, Bröer S. (2015). Creatine as a booster for human brain function. How might it work?. Neurochemistry International, 89, 249-259.
57. Ramírez-Campillo R, González-Jurado JA, Martínez C, Nakamura FY, Peñailillo L, Meylan CM, Izquierdo M. Effects of plyometric training and creatine supplementation on maximal-intensity exercise and endurance in female soccer players. Journal of Science and Medicine in Sport, 2016; 19(8), 682-687.
58. Rawson ES, Venezia AC. Use of creatine in the elderly and evidence for effects on cognitive function in young and old. Amino acids, 2011; 40(5), 1349-1362.
59. Rawson ES, Miles MP, Larson-Meyer DE. Dietary supplements for health, adaptation, and recovery in athletes. International Journal of Sport Nutrition and Exercise Metabolism, 2018; 28(2), 188-199.
60. Smith AE, Fukuda DH, Ryan ED, Kendall KL, Cramer JT, Stout J. Ergolytic/ergogenic effects of creatine on aerobic power. International Journal of Sports Medicine, 2011; 32(12), 975-981.
61. Stares A, Bains M. The Additive Effects of Creatine Supplementation and Exercise Training in an Aging Population: A Systematic Review of Randomized Controlled Trials. Journal of Geriatric Physical Therapy, 2020; 43(2), 99-112.
62. Thomas DT, Erdman KA, Burke LM. Position of the Academy of Nutrition and Dietetics, Dietitians of Canada, and the American College of Sports Medicine: nutrition and athletic performance. Journal of the Academy of Nutrition and Dietetics, 2016; 116(3), 501-528.
63. Tscholl P, Alonso JM, Dollé G, Junge A, Dvorak J. The use of drugs and nutritional supplements in top-level track and field athletes. The American Journal of Sports Medicine, 2010; 38(1), 133-140.
64. Turner CE, Byblow W D, Gant N. Creatine supplementation enhances corticomotor excitability and cognitive performance during oxygen deprivation. Journal of Neuroscience, 2015; 35(4), 1773-1780.
65. Wang CC, Fang CC, Lee YH, Yang MT, Chan KH. Effects of 4-week creatine supplementation combined with complex training on muscle damage and sport performance. Nutrients, 2018; 10(11), 1640.
66. Williams J, Abt G, Kilding AE. Effects of creatine monohydrate supplementation on simulated soccer performance. International Journal of Sports Physiology and Performance, 2014; 9(3), 503-510.
67. Yáñez-Silva A, Buzzachera CF, Piçarro IDC, Januario RS, Ferreira LH, McAnulty SR, Souza-Junior TP. Effect of low dose, short-term creatine supplementation on muscle power output in elite youth soccer players. Journal of the International Society of Sports Nutrition, 2017; 14(1), 1-8.
68. Zuniga JM, Housh TJ, Camic CL, Hendrix CR, Mielke M, Johnson GO, Schmidt RJ. The effects of creatine monohydrate loading on anaerobic performance and one-repetition maximum strength. The Journal of Strength & Conditioning Research, 2012; 26(6), 1651-1656.

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A Qualitative Study of the Sportive Performance Levels of Elite and Amateur Athletes in the Covid 19 Process

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Abstract

COVID-19 affected the whole world and affected the sports circles negatively as in many areas of life. While sports federations and sports circles focused on managing the process with effective solutions, they had to give a new direction to their work by having to continue their training at home in order not to reduce their performance levels, which are elite and amateur who continue to do sports and do sports at high performance levels. In this context, this research was carried out to collect and examine information about the developing training processes that elite and amateur athletes had to carry out their own researches at home due to the COVID-19 epidemic and their efforts to maintain their performance levels. 6 elite and 6 amateur athletes from different branches voluntarily participated in the study. In the study, interviews were conducted, one of the qualitative methods. A structured interview form was used as a data collection tool. It was used for descriptive analysis in the analysis of the data. In our descriptive analysis, now, in our research, the efforts of elite athletes and amateur athletes to protect the performance levels of Cov-19 quarantine athletes and the training to overcome the difficulties they encounter, the emerging difference is where the club approach is where the club approach, the surrounding approach and the social media approach are professional and amateur athletes look at the emerging problems from the same window and meet a difference in their individual theme.

Key words: Covid 19, Sporting performance, Elite athlete, Amateur athlete

Covid 19 Sürecinde Elit Ve Amatör Sporcuların Sportif Performans Seviyeleri İle İlgili Nitel Bir Çalışma

COVID-19 affected the whole world and affected the sports circles negatively as in many areas of life. While sports federations and sports circles focused on managing the process with effective solutions, they had to give a new direction to their work by having to continue their training at home in order not to reduce their performance levels, which are elite and amateur who continue to do sports and do sports at high performance levels. In this context, this research was carried out to collect and examine information about the developing training processes that elite and amateur athletes had to carry out their own researches at home due to the COVID-19 epidemic and their efforts to maintain their performance levels. 6 elite and 6 amateur athletes from different branches voluntarily participated in the study. In the study, interviews were conducted, one of the qualitative methods. A structured interview form was used as a data collection tool. It was used for descriptive analysis in the analysis of the data. In our descriptive analysis, now, in our research, the efforts of elite athletes and amateur athletes to protect the performance levels of Cov-19 quarantine athletes and the training to overcome the difficulties they encounter, the emerging difference is where the club approach is where the club approach, the surrounding approach and the social media approach are professional and amateur athletes look at the emerging problems from the same window and meet a difference in their individual theme.

Anahtar Kelimeler: COV 19, Sportif Performans, Elit Sporcu, Amatör Sporcu

INTRODUCTION

The new (COVID-19) is a virus that initially was detected in a group of patients in Wuhan (China) with respiratory symptoms (fever, cough, breath shortening) on 13 January 2020. (11). By February 2020, COVID-19, the 2019 Covid illness, was identified by the World Health Organization. The COVID-19 virus was referred to as the serious acute Covid syndrome 2 (SARS-CoV-2) (18).

In mid-January 2020, the rate of transmission of the virus from person to person increased. Cases of this virus began to be recorded in several countries in Europe, North America and Asia Pacific. The World Health Organization announced a worldwide pandemic on 11 March 2020. By 14 February 2021, it was reported that although 109.259.500 patients were confirmed and 81.476.325 recoveries worldwide reported but on the other hand 2.408.274 people had died because of the infection (17).

Sports organizations have now been under the impact of the Covid-19 virus that has encircled the entire planet and have been an organic component of our social life. Almost all of the 206 (16) nations in the globe are on notice as a result of this threat. The notion of sport, which has a dynamic structure, is cut off by essential dangers and is being sought to put all its units in four walls. The current scenario has nonetheless shown an extremely thoughtful image for sport which, owing to their active structure, has vitality at its heart and draws the people after it (14).

States across the world have taken considerable action against this virus, which is spreading around the world, particularly on the continent of Europe, causing deaths and being reported to be a global epidemic. (9). Moreover, sports, religion, education, worldwide major sport organizations, and activities in many sectors, are postponed or cancelled.

With the globe in the COVID-19 epidemic suddenly and unparalleled, sports are confronting catastrophe in the same way as any other (14). Sporting events, tournaments, and trainings have been halted and canceled indefinitely in numerous nations across many branches. Large groups, millions of foreign tourists and host nations are at danger of viruses during major sporting events (19).

Activities bringing together groups are therefore strongly connected with extremely serious human health concerns (14). So much so that biological weapons were termed sports organizations. The football match between Atlanta (Italy) and Valencia (Spain) on 19 February 2020 in Bergamo, Italy, altered the virus with 45,792 spectators taking part in the UEFA Champions League, contributing to the major outbreak of the virus in Spain and Italy, for example (2).

It is obvious that the pandemic has had a deep impact on athletes who do not belong to the danger categories, therefore disrupting the athletes' training and competitive organizations. This resulted in sporting activities being deprived of some branches and all sub-categories (amateur, youth and children) and becoming victims. The COVID-19 process is significant in terms of pauses in athletes' training programs, detrimental impacts on breathing systems and short- and long-term training ability. These pandemic issues that will long influence sport and athletes demand strong solutions (13). Everyone knows that athletes are healthy and powerful, but they are considered to have a good and better time during the pandemic, but not outside the area that experiences negative conditions (10). Each sportsman tries to achieve and sets suitable targets (8).

METHOD

The interviewing approach, one of the qualitative methods of research, was employed in this study. The literature usually lists three types of interviews: 'structured interview, unstructured interview and semi-structured interview' (15). The structured interview aims to assess the comparability and the difference between the data provided by the interviewers and make corresponding comparisons (20). An unstructured interview is a kind of communication that is done spontaneously in the natural flow of verbal engagement with another person without interviewing a protocol (4). Frequency in semi-structured interviews is favored by researchers, since it overcomes the constraints on the drafting and completion of tests and questionnaires and provides detailed information on a particular topic (15). A semi-structured interview form was utilized in this study as a method for data gathering.

Interview questions were created with the assumptions and the goal of the study taken into account in the literature. Interviews were performed by means of a semi-structured type of interview after expert opinions had been taken. Online

interviews with 6 elite athletes and 6 amateur athletes were made and voice recordings were created. The interviews with participants' consent were taped with a voice recorder. These audio recordings were then presented, similar data were explained and descriptive analysis was done through interpretation under the themes defined.

Findings

Findings Related to Demographical Information

The information about the gender, age, branch, sport level, sporting history, number of nationality, and education level of the athletes participating in the research is given in Table 1.

Table 1: Distributions of the Participants Related to their Demographical Information

Category	Gender	Age	Branch	Sports Level	Sportsmanship Background	Number of being National	Education Level
K1 – ELİTE	Female	24	Taekwondo	National Athlete	14 Years	7	Bachelor
K2 – ELİTE	Female	22	Volleyball	Professional	10 Years	0	Bachelor
K3 – ELİTE	Male	20	Basketball	National Athlete	10 Years	8	Bachelor
K4 – ELİTE	Male	21	Athleticism	National Athlete	10 Years	18	Bachelor
K5 – ELİTE	Male	22	Swimming	National Athlete	2 Years	1	Bachelor
K6 – ELİTE	Male	24	Basketball	Professional	15 Years	0	Bachelor
K7 – AMATEUR	Male	24	Football	Amateur Athlete	9 Years	0	Bachelor
K8 – AMATEUR	Male	23	Football	Amateur Athlete	12 Years	0	Bachelor
K9 – AMATEUR	Male	25	Futsal	Amateur Athlete	7 Years	0	Bachelor
K10-AMATEUR	Male	27	Futsal	Amateur Athlete	10 Years	0	Bachelor
K11-AMATEUR	Female	20	Karate	Amateur Athlete	3 Years	0	Bachelor
K12-AMATEUR	Female	24	Volleyball	Amateur Athlete	3 Years	0	Bachelor

The distribution of athletes by demographic factors is shown in Table 1. This research includes eight athletes, of which 4 are men and 4 females. When an examination is taken of the age levels of the participating athletes, they are between 20 and 27 years of age. When examining the branches of the athletes included in the research, 9 distinct branches may be seen (Taekwondo, Volleyball, Athletics, Swimming, Basketball, Football, Futsal, Karate, and Volleyball). When the sports levels of research athletes are analyzed, 6 top athletes and 6 amateur athletes are shown. When examining the history of the sports of the athletes involved, they are between 2 years and 15 years. When athletes' nationality levels are analyzed, the nationality of the 4 national athletes is found to be between 1 and 18. When the degrees of education of the athletes involved in study are assessed, it is shown that everyone is an undergraduate.

Findings Regarding the Evaluation of Elite and Amateur Athletes' Athletic Performance Levels in the Covid-19 Process

Within the research fields, the elite and amateur athletes were asked about their assessment of perceptions of their level of sporting performance during the COVID-19 process. The four subjects (Individual approach, Club approach, Surrounding approach, Social media approach) were identified. The results were provided. Conclusions on these topics will be explored and examined in the following headings.

Individual Approach

1. The question of *"How would you describe the effect of the COVID-19 process on your sport performance?"* asked under the theme of an individual approach by the athletes participating in the research, all of the athletes were asked, both as regards the performance and physical activity levels, as the necessary training conditions during the epidemic have not been fulfilled and The pandemic has had a detrimental effect in this respect. The main replies to this question from professional and amateur athletes are:

"I feel like my physical condition at the end of a competition is like a feeling of burnout, and my performance is over" (P1).

"We experienced poor performance because we could not train enough" (P4).

"Especially it had negative effects physically" (P5).

"There was a decrease because there was no continuity and the conditions for doing sports were restricted" (P7).

"Even though I continued my individual studies, it had a negative impact on my performance as the sport I did was a team sport" (P10).

"There was an extreme degree of immaturity and decline" (P11).

2. Once they asked the question, "*What solution has your unable to go out during the COVID 19 process in order to maintain your level of sporting performance?"* on the subject of individual approaches of the athletes taking part in research, all the elite and amateur athletes stated that they tried to maintain their level of sport through their very own resources. The prominent replies to this topic by elite and amateur athletes:

"I tended to do exercises and activities at home" (P2).

"I tried to keep my sportive performance level high by doing exercises for my branch at home" (P3).

"He directed me to do exercises that can be done at home" (P5).

"I tended to exercise at home with my own means" (P7).

"I continued to do sports with the opportunities at home" (P8).

"I tended towards activities such as sit-ups, push-ups, and jumping rope that I would do with my own body weight at home" (P9).

3. When asked about "*What do you think about the physical activities you performed in quarantine, considering your competition period after COVID-19?"* the athletes of the elite usually say that they will try to keep their physical condition in quarantine but that it will take time to catch up with the athletes taking part in research. 3. 3. They did. They did. In contrast, amateur sportive athletes said that in general during the quarantine process they have attempted to preserve their body and have seen the advantages of individual effort.

"I guess I cannot enter the competitions for a long time because it will take a long time for my performance to come back." (P1).

"I will need a 3-month study after Covid." (P2).

"The only thing I can do is not to experience a decrease in pre-existing factors such as strength and endurance." (P7).

"I did a developing and strengthening sport" (P8).

"If I had continued my individual studies while I was doing sports with the team, I would have seen a lot of benefits" (P10).

4. The questions asked under the theme of the individual approach of the athletes participating in the research; To the question of *"What kind of a training program did you plan to increase your sportive performance level after COVID-19?"*, both elite and amateur athletes said that after the quarantine period, they would first do strength, endurance and weight exercises to increase their sportive performance levels, and then they would focus on competition-based

exercises. The prominent answers of elite and amateur athletes to this question are as follows:

"Priority for recovery with short-term intense training" (P1).

"In the first place, I plan to do fitness-based exercises and then make a technical training program" (P2).

"I prepared a strength and endurance program like the season we just started"(P4).

"First of all, I will do studies to increase physical performance, and then I will do technical studies of my branch" (P6).

"I plan to start with strength training with an intense training program" (P8).

"I will continue my strength training and Core Training" (P9).

"I did jogging training after strength training" (P10).

It is observed that both elite and amateur athletes questioned within the scope of the research are negatively impacted by the quarantine procedure within the subject of individual approach and they strive to preserve their sportive performance levels with their own efforts. Under the topic of personal approach, it is observed that both elite and amateur athletes may look at the unfavorable situations in the quarantine process from the same frame and approach the remedies with the same thinking.

Club Approach

1. When questioned about *"What assistance did you receive in order to keep your competitive (team-individual) performances in the COVID-19 procedure?"* under the topic of club approach for athletes taking part in the research? They said they got their instructors' backing. Amateur athletes, on the other hand, complained that their clubs and professors could not get sufficient assistance to safeguard their performance during quarantine competitions. The main replies to this issue by top and amateur athletes are:

"Exercise programs that can be done at home were shared" (P2).

"I was in constant communication with our coaches and managers and I received support for continuous work programs" (P3).

"I received continuous online training from my trainer" (P4).

"I did not receive any significant support because I did sports at an amateur level" (P7).

"I did not receive any support from my club or my teachers" (P9).

"We did not receive significant support from my club and my teacher." (P11).

2. Asking the participating athletes under the topic of club approach, "*What were your financial expectations of your club in order to sustain your level of sport in COVID-19?* When asked, "What is what you expected to do?" the best athletes typically said they expected that their clubs won't have their wages cut financially to safeguard their sport throughout the quarantine time; nevertheless, the club did not fulfill these expectations and their wages were decreased. Amateur athletes, on the other hand, stated that they generally have financial expectations from their clubs in order to protect their sportive performance during the quarantine period, but amateur clubs do not respond to these expectations. The prominent answers of elite and amateur athletes to this question are as follows:

"My expectation from my club was that my salary would not be cut, but my expectations were not met" (P2).

"Overall it was good that our expectations were met. However, our financial expectations were not met sufficiently." (P4).

"In other words, the expectations were that the salaries were fully paid, but it was not as expected" (P5).

"Of course there was a financial expectation, but it could not be met by the club" (P7).

"We had financial expectations, but we could not get financial support because we played football in amateurs" (P10).

"I didn't have any expectations, and it happened as I thought." (P11).

3. The questions of the athletes participating in the research under the theme of club approach; To the question "*What are your expectations from the club you are affiliated with and your coaches in order to increase your sportive performance level again after COVID-19?"*, both elite athletes and amateur athletes stated that they generally have expectations from their clubs and teachers about training programs in order to increase their sportive performance levels after the quarantine period. The prominent answers of elite and amateur athletes to this question are as follows:

"Preparing the best training programs for the rapid increase in our sports performance" (P2).

"Preparing more intense and heavy training programs" (P3).

"Giving the necessary physical, technical and tactical training in the best way" (P6).

"Preparation of personalized training programs" (P7).

"I would like him to prepare a separate training program for each athlete, taking into account the physical conditions of the athletes, and make them ready for the league." (P9).

"Preparation of individual training" (P10).

It is shown that the elite athletes questioned within the study area under the theme of a club approach have gotten the help and direction from the club and their coaches, but their expectations regarding the financing expectations have not been fulfilled enough. On the other side, amateur athletes claim that the training programs, advice, and financing requirements are not supported by their clubs and teachers. The club method shows there are substantial variations in the support and management of their players and financial assistance between top athletes and amateur clubs.

Yet, it is monitored that the expectations of both elite and amateur athletes, who were interviewed under the theme of club approach, from both the club and their coaches in order to increase their sportive performance levels after the quarantine period, are the same in terms of preparing a training program.

Surrounding Approach

1. Asked under the theme of surrounding approach of the athletes participating in the research, *"What are the positive or negative effects of your friends on you in order to maintain your sportive performance level during the Cov-19 process?"*, elite athletes generally interview their friends in order to maintain their sportive performance levels during the quarantine period, in terms of motivation. It was indicated that they had positive effects. Amateur athletes, on the other hand, stated that they did not have a positive effect because they could not see their friends very often in order to maintain their sportive performance levels during the quarantine period. The prominent answers of elite and amateur athletes to this question are as follows:

"Most of the time, it had positive effects that increase motivation" (P1).

"It has had a positive effect on us to increase each other's motivation by staying in constant communication and to make efforts to be better" (P3).

"They contributed positively such as exchanging ideas about the movements we can do together at home" (P5).

"My friends did not have many positive or negative effects because both our meetings and activities were restricted due to the current pandemic" (P7).

"Since I did not meet with any of my friends because of the pandemic, it did not have any effect in any way" (P10).

"I don't think they have any effects because we couldn't meet as often as before the pandemic" (P11).

2. The questions asked under the theme of surrounding approach of the athletes participating in the research; To the question of *"Can you compare your efforts to protect the sportive performance levels of your friends during the COVID-19 process?"*, both elite athletes and amateur athletes were asked to compare their friends' efforts to maintain their friends' sportive performance levels during the quarantine period, as there are usually differences in personal development and sportive performance. They stated that there was no comparison made because there was no sharing to compare the performance level. The prominent answers of elite and amateur athletes to this question are as follows:

"We did not share any information with my friends on this issue" (P2).

"Every athlete's personal development is different, so I did not make a comparison" (P3).

"I cannot make comparisons because there is no continuous information sharing" (P6).

"I did not feel the need for comparison because in individual training, the person trains according to his/her own deficiencies" (P7).

"I did not make such a comparison because everyone has a different way of working" (P8).

"Since everyone is individual, I did not make such an effort" (P11).

3. The questions asked under the theme of surrounding approach of the athletes participating in the research; To the question "*Did the people in your house support you to maintain your sportive performance level during the COVID-19 period?"*, both elite athletes and amateur athletes said that they generally received moral, motivational and psychological support from family members in order to maintain their sportive performance levels after the quarantine period. The prominent answers of elite and amateur athletes to this question are as follows:

"They provided the necessary support in terms of moral motivation" (P2).

"I felt their support in this difficult period in terms of spirituality" (P3).

"They provided a lot of psychological support" (P5).

"Preparation of personalized training programs" (P7).

"Positive views and support of my family contributed a lot to me in terms of morale and motivation" (P10).

"My parents did sports with me to increase my morale and motivation" (P10).

Elite athletes who were questioned in the field of study under the subject of the environmental approach indicated that they were motivated by maintaining and growing communication with their friends so that their sport performance levels may continue during the quarantine procedure. Amateur athletes on the other hand said that the lack of connection with their friends throughout the quarantine procedure did not assist in any way to maintaining their level of sporty performance. Under the surrounding approach theme, it is seen that there are significant differences between elite athletes and amateur athletes in terms of communication between club athletes and the concepts of being a team and acting together.

Yet, it can be indicated that both elite and amateur athletes questioned under the subject of the approach have the same views and points of view in relation to their own efforts and the contribution they make to keep their sporting levels during their quarantine.

Social Media Approach

1. The questions posed by the athletes involved in the field of social media approach: *"What are your ideas on the contribution of the films which have been published on your own social media sports during Cov-19?"* Elite athletes and

amateur athletes said the social media posted films throughout the ephemeral have contributed by maintaining their training to protecting their sport performance and inspiration. The main replies to this issue by top and amateur athletes are:

'"I was able to continue my training regularly thanks to some personal addresses I followed" (P2).
"Elite athletes from our own sports branch, who did their training during the Cov-19 period and shared on social media, contributed to us during the time we could not do sports" (P4).
"It has made a positive physical contribution because of the sharing of exercises at home" (P6).
"The sharing of different teachers allowed me to do different trainings and I saw that it contributed to the diversity of training" (P10).
"Videos shared on social media contributed to our continuing training by keeping our motivation level high" (P11).
"The videos I watched while I was away from training encouraged me to train and contributed to maintaining my sportive performance level" (P12).

2. The issues posed by the research engaging athletes in the social media strategy; With regard to the question *"What helped your efforts to maintain your sport level in the COVID-19 process?"* Both professional and amateur athletes have said that social media have helped preserve their sports performance, continuing their continuous training. The main replies to this question are from top and amateur athletes:
"It was a kind of online training by leading us to do sports at home and allowed us to partially maintain our sportive performance level" (P4).

"It allowed me to protect my sportive performance by following the videos related to my branch" (P5).

"It allowed me to do the right studies by watching videos related to my own branch" (P6).

"With the sharing of different coaches, the training I did during this epidemic helped me to maintain my sportive performance" (P9).

"It helped me maintain my sportive performance level by enabling me to practice different types of training related to my branch" (P10).

"It helped me maintain my sportive performance level thanks to the videos I follow on social media" (P11).

3. When asked under the theme of the social media approach of the athletes participating in the research, "*Did an athlete you take as an example on social media contribute to your use of training methods during the COVID-19 process?"* The branches (P2, P3, P6) are not suitable for domestic work, therefore, the sampled athletes cannot benefit from their branch-specific training shared via social media, but the elite athletes who do individual sports (P1, P4, P5), on the other hand, share the specific training for their branches shared by the sampled athletes via social media. It was stated that they could benefit from the methods. Amateur athletes, on the other hand, stated that, regardless of team and individual athletes, following the training methods specific to their branches shared by the athletes they took as an example on social media during the quarantine period provided positive contributions in terms of motivation. The prominent answers of elite and amateur athletes to this question are as follows:

"No because my branch is not suitable for indoor activities" (P2).

"No because my branch is not suitable for indoor training" (P6).

"Yes, we had the chance to do home exercises by following the athletes related to our branch" (P4).

"Yes, we had the chance to try the training methods of the athletes we took as an example" (P5).

"Yes, after watching their work, it made me more willing in my own work" (P10).

"Yes, following elite athletes increased my motivation" (P12).

4. When asked under the theme of social media approach of the athletes participating in the research, *"How did your club support you in maintaining your*

sportive performance level by using social media channels during the Cov-19 process?", elite athletes used social media channels to maintain their clubs' sportive performance levels during the quarantine process They stated that they provided them with support such as in-home training programs and nutrition programs. Amateur athletes, on the other hand, stated that they did not provide any support by using social media in order to maintain the sportive performance levels of their clubs during the quarantine period. The prominent answers of elite and amateur athletes to this question are as follows:

'"In-home exercises were shared from the media groups used" (P2).
"He shared the home training schedules and nutrition programs that the team should do" (P5).
"In-home exercise sharing was done through various teleconference methods" (P6).
"No support was provided because it was an amateur level" (P7).
"The club did not provide any support during this process" (P9).
"Unfortunately, I could not get any support from my club in this regard" (P12).

Elite athletes interviewed under the subject of social media in the field of research have stated that the training videos specific to their branches shared by the athletes they have adopted in social media as examples cannot be taken advantage of as their branches cannot be suitable for domestic work. Elite athletes who practice sports alone, however, say they may profit from their training films published by the athletes they take via social media as models. Amateur athletes, however, claimed that they may benefit from training videos for their branches, given by the example of the athletes in the social media, whether they are a team or solo sport, in order to preserve their sporting performance during the quarantine time.

In the context of social media approach, the notion of using the social media to maintain its level of sporting performance shows considerable variations between elite and amateur athletes.

Elite athletes said their clubs utilize social media networks to maintain and support their level of sporting performance, including in-house training and nutrition programs. Amateur athletes, however, have declared, by utilizing social media to sustain their clubs' sporting performance during the quarantine period, that they do not favor it. Under the subject of social media, another important distinction between elite sportsmen and amateur sportsmen is the efforts of the clubs to preserve their sporting standards through social media channels during their quarantine periods.

However, the same ideas and perspectives on the contribution of the media to maintaining their sporting levels throughout the quarantine period and the contribution of social media to the maintaining of their level of performance can also be observed in elite and amateur athletes interviewed under the theme of Social Media.

DISCUSSION - RESULT

The quarantine process under the subject of **individual approach** is negated by the elite as well as amateur athletes questioned in the research, and they attempt to preserve their own level of sport performance. Under the themes of individual approach, elite and amateur athletes can look from the same frame and approach the solutions with the same thinking under the unfavorable situations in the quarantine process. *It is thought that the reason for this is the thoughts of both elite and amateur athletes to maintain their individual sportive performance levels and the desire to be ready for the unusual quarantine period.*

Coşkuntürk (3) stated that the motivation levels of the national athletes in their branch are higher than the non-national athletes. According to Thomas (12), self-confidence is the keyword in success motivation and elite athletes have more self-confidence. According to Aslan and Kuru (1), the motivations of professional footballers to show strength, approach success and avoid failure were found to be higher than amateur football players.

It is monitored that the elite athletes interviewed under the theme of **club approach**

within the scope of the research stated that they received support from clubs and coaches in terms of training program and guidance, but their expectations were not met enough in terms of financial expectations. Amateur athletes, on the other hand, state that they do not receive support from their clubs and coaches in terms of training program and guidance, and financial expectations. Under the theme of club approach, it is seen that there are significant differences between elite athletes and amateur clubs in terms of supporting and guiding their athletes and financial support. *The reason for this is thought to be due to the difference in the perspectives of professional clubs towards their athletes, the higher investments made in the past, and the desire for their athletes to be more ready during and after the quarantine. From the perspective of amateur clubs, it seems impossible for clubs to think long-term due to the uncertainty of the status of amateur leagues during and after the quarantine.*

However, it is seen that the expectations of both elite and amateur athletes, who were interviewed under the theme of club approach, from clubs and coaches in order to increase their sportive performance levels after the quarantine process, are the same in terms of preparing a training program. *The reason for this is thought to be that both elite and amateur athletes want to keep their sportive performance levels at a high level, as is the case under the theme of individual approach.*

According to Halabachi and others, athletes during the epidemic are expected to have a quality of life (equipment, nutrition), according to (6). If feasible, cardio, weights (dumbbell, band elastic, medical balls etc.) and comparable training materials should be supplied for areas where the athletes reside. Then, Jukic et al. Training and nutrition plans according to (7) can be organized according to the branches of the athletes, their features and their surroundings.

Elite athletes interviewed under the theme of **surrounding approach** within the scope of the research stated that their friends contributed positively in terms of motivation by keeping and increasing their communication with their friends in order to maintain their sportive performance levels during the quarantine process. Amateur athletes, on the other hand, stated that their friends did not contribute in any way to maintain their sportive performance levels due to the loss of communication with their friends during the quarantine process. Under the surrounding approach theme, it is seen that there are significant differences between elite athletes and amateur athletes in terms of communication between club athletes and the concepts of being a team and acting together. *The reason for this is that the concepts of communication between club athletes, being a team and acting together are more common among elite athletes than amateur athletes, due to the reasons that increase the loyalty to the clubs and the loyalty of the athletes to each other, such as the high income and financial opportunities in professional clubs, the fact that elite athletes maintain their lives with what they earn from professional clubs thought to be developed.*

However it can be shown that both elite and hobbyists interviewed on the environmental subject have the same views and views in terms of comparing their own efforts with their friends and their family members' contribution to maintain their sporting levels throughout the quarantine period. *It is thought that the reason for this may be because both elite and amateur athletes do not see their teammates as competitors and the support of family members and the concept of family will not change compared to elite or amateur athletes.*

Elite athletes who were interviewed under the theme of **social media approach** within the scope of the research stated that they could not benefit from the training videos specific to their branches shared by the athletes they took as examples through social media, as their branches were not suitable for domestic work. However, elite athletes who do individual sports stated that they can benefit from the training videos specific to their branches shared by the athletes they take as examples through social media. Amateur athletes, on the other hand, stated that in order to maintain their sportive performance levels during the quarantine period, they can benefit from the training videos specific to their branches, shared by the athletes they take as an example, through social media, regardless of whether they are team or individual sports.

In the context of social media approach, the notion of using the social media to maintain its level of sporting performance shows considerable variations between elite and amateur athletes. *It is thought that the reason for this is that elite athletes need different social media videos less because they receive the necessary support from their clubs and teachers through social media, and amateur athletes use social media more actively because they cannot get enough support from their clubs and teachers compared to elite athletes.*

Elite athletes stated that their clubs use social media channels to maintain their sportive performance levels and provide them with support such as in-home training programs and nutrition programs. Amateur athletes, on the other hand, stated that they did not provide any support by using social media to maintain the sportive performance levels of their clubs during the quarantine period. Under the theme of social media approach, another significant difference between elite athletes and amateur athletes in order to maintain their sportive performance levels during the quarantine period is the efforts of the clubs to maintain the sportive performance levels of their athletes by using social media channels. *The reason for this, according to the club approach theme, is that the investments given to the athletes in the past were more and they want their athletes to be more ready for quarantining. It is also believed that the clubs' attitudes towards their athletes are different. It is anticipated that the ambiguity of the fate of amateur league post-quarantine will prevent hammers from thinking any longer.*

Nevertheless, the same ideas and perspectives on the contribution of the media to maintaining their sporting levels throughout the quarantine period and the contribution of social media to the maintaining of their level of performance can also be observed in elite and amateur athletes interviewed under the theme of Social Media.

According to Gümüş (5), the club structure is suited to modern communication technologies and social media. Reasons including mass communication, international attraction, and fast-paced and cost-effective sports clubs make use of modern communications technology and social media. Moreover, the club structure has been determined to impact on the usage of social media and to prevent the clubs from making appropriate and efficient use of social media.

Consequently, when we compare the efforts of elite athletes and amateur athletes in maintaining their athletic levels over the quarantine period of the Cov-19 and their approaches to overcoming their problems, the surrounding and social media approaches were determined to play a major role in the issues depending on the club's approach. However, the problem arising from the same window and no differing approach subject matter is examined by professional and amateur athletes.

REFERENCES.

1. Aslan A, Kuru E. Profesyonel Ve Amatör Futbolcuların Başarı Motivasyonu Farklılıkları Ve Sportif Tecrübe İle İlişkisi. Gazi Beden Eğitimi Ve Spor Bilimleri Dergisi, 2002; 7(2), 23-30.
2. Babak Nakhostın-Roohı B. The Necessity For More Attention By The Health System To The Role Of Regular Physical Activity In Reducing Viral Infections İnduced Mortality. Journal of Exercise Physiology And Health, 2020; 3(2), 19-20.
3. Çoşkuntürk O. Kişilik Özelliklerinden Kendine Güven, Kararlılık ve Başları Dürtüsünün Sportif Performansa ve Geliştirilmesine Etkileri, Yüksek Lisans Tezi, G. Ü. Sos. Bil. Enst., Bed. Eğt. ve Spor Anabilim Dalı, Ankara, 1988, s. 61.
4. Gall, M D, Borg WR, Gall, J P. Educational research: An introduction. Longman Publishing, 1996.
5. Gümüş S. Futbol kulüplerinin Kurumsal iletişim açısından Sosyal Medya kullanımı: Türkiye'Deki dört büyük Spor kulübünün Incelenmesi (Doctoral dissertation, Marmara Universitesi (Turkey), 2019.
6. Halabchi F, Ahmadinejad Z, Selk-Ghaffari M. COVID-19 epidemic: exercise or not to exercise; that is the question! Asian Journal of Sports Medicine, 2020; 11:1.
7. Jukic I, Milanovic L, Krakan I, Njaradi N, Calleja-González J, Cuzzolin F. Strength and conditioning in top level team sports: An individual discipline. 18th International Conference "Physical Conditioning of Athletes 2020.
8. Kaplan E, Akyüz O. Futbolcuların Başarı Hedefleri ve Spor Karakterleri Arasındaki İlişkinin İncelenmesi. Uluslararası Egzersiz Psikolojisi Dergisi, 2020; 2(2), 82-90.
9. Karcıoğlu Ö. What is Coronaviruses, and how can we protect ourselves? Anka Tıp Dergisi, 2020; 2(1), 6671.
10. Koçak U, Özer KD. Covıd-19 Pandemisi, Spor, Sporcu Üçgeni: Etkilenimler ve Öneriler. İzmir Katip Çelebi Üniversitesi Sağlık Bilimleri Fakültesi Dergisi, 2020; 5(2), 129-133.
11. T.C. Sağlık Bakanlığı, Covid-19 Rehberi, Mart 2020 - Ankara.
12. Thomas R. Science and Soccer, An Imprint of Chapman & Hall, London, 1996, p.280-285.
13. Timpka T. Sports health during the SARS-Cov-2 pandemic. Sports Medicine, 2020; 50(8), 1413-1416.
14. Türkmen M, Özsarı A. Covid-19 Salgını ve Spor Sektörüne Etkileri. IntJSCS, 2020; 8(2):55-67.
15. Türnüklü A. Eğitimbilim araştırmalarında etkin olarak kullanılabilecek nitel biraraştırma tekniği: Görüşme. Kuram ve uygulamada eğitim yönetimi, 2000; 24(24), 543-559.
16. Wikipedia. Dünyadaki ülke sayısı. Erişim adresi, tr.wikipedia.org/ 2020.
17. Wikipedia. Covid-19 Pandemisi. Erişim adresi, COVID-19 pandemisi - Vikipedi 2021.

18. World Health Organization. Director-General's remarks at the media briefing on 2019nCoV on 11 February 2020. https://www.who.int/dg/speeches/detail/who-director-general-s-remarks-at-the-media-briefing-on-2019-ncov-on-11-february-2020 (Accessed on February 12, 2020).
19. Yanagısawa N, Wada K, Spengler JD, Sanchez-Pina R. Health Preparedness Plan For Dengue Detection During The 2020 Summer Olympic And Paralympic Games İn Tokyo. Plos Oneglected Tropical Diseases, 2018; 12(9), Doi:/10.1371/Journal.Pntd.0006755.
20. Yıldırım A, Şimşek H. Sosyal bilimlerde nitel araştırma yöntemleri. Seçkin yayıncılık. 2013.