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Preface

The Performance in Sport and Exercise aims to provide its readers with the highest quality and effective articles through a careful peer review and editorial work process. The articles to be published include both detailed scientific methods and guided results for sports professionals, providing the opportunity for immediate application in the field. In this sense, it will contribute to the field of sports sciences by fulfilling the requirements and observing ethical principles.

The Performance in Sport and Exercise is the official journal of Ankara University Performance Analysis in Sports Application and Research Center (ASPAM). The ASPAM is a center established to combine theoretical knowledge and experience in all sports-related subjects and to contribute to the field of sports sciences.

The Performance in Sport and Exercise is published biannually (June and December) in English. The Journal publishes scientific papers in the scope of sport, exercise, physical activity, exercise and health, sports medicine, biomechanics, sport and exercise physiology, sport and exercise psychology, performance in sport, training, and technology in sport. As the editorial board, we sincerely wish the first issue of our journal to be beneficial to the sports science community.

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Performance Analysis in Sport and Exercise

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The Acute Effect of Zero Gravity Chair and Breathing Exercises on Soccer Players HRV

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Abstract

This study aims to determine the acute effect of breathing exercises on soccer players' HRV while lying down on a zero-gravity chair. According to this purpose, 12 soccer players participated in the study. To collect data, Inner Balance HeartMath biofeedback device was used. During the pretest soccer players sat in an upright position and their HRV measurements were taken. After a few minutes, soccer players were asked to lie down on a zero gravity chair inhale in 4 seconds and exhale in 4 seconds (4X4 Breathing Exercise). The results have shown that there is a significant difference between pretest and posttest. The zero-gravity chair and HRV breathing exercises have an acute effect on soccer players' coherence and autumn nerve system in a positive way.

Keywords: Heart rate variability, breathing exercises, zero gravity chair, soccer

INTRODUCTION

The most popular game in the world, which is soccer, has come to a point where physical performance may not be enough to achieve success. Many factors affect the performance in soccer like talent, training mentally and physically, financial status, management, stress management, sports phycology, training science, etc. (Carling, Williams & Reilly, 2007; Diment, 2014; Surujlal, 2016). When all these factors come together in soccer it may bring the clubs or players' performance to an optimal level. However, there is one factor that is hard to measure or control which is phycological factors because it could change depending on the nationality, person, culture, childhood, etc. (Kashima, 2000). This is also valid for athletes because every athlete has a different motivation and psychology (Mitić et. all., 2021). However, this is not an obstacle in sports psychology, there are many ways to measure psychological

parameters like scales and wearable technology (Aldırmaz, 2022; Ekmekçi, 2022, Beşler, 2022). Recent studies have shown that wearable technology can be used to measure mental and psychological power in sports (Seshadri et. all., 2017; Waqar et. all., 2021).

Psychophysiology is one of the disciplines in psychology which considers physiology and psychology together. In simple words, the body and the mind can't be separated from feelings (Hugdahl, 1995). In the psychophysiological perspective heart rate variability (HRV) is a very important tool to have an idea about how the autonomic nervous system works. In short, it gives information about how coherent the person is (McCraty & Zayas, 2014).

HRV is also an important variable in sports to understand the athlete's mental condition. Recent studies about HRV in sports are increasing to improve the performance of athletes physically and mentally (Pagaduan et. all., 2020; Gül, 2022). It is known that when an athlete is coherent (the autonomic nervous system is in balance according to their HRV) their mental performance also goes up to an optimal level which affects their physical performance accordingly (Ekmekçi, 2022).

Soccer is a long, hard, challenging, and multi-minded game that requires patience and a high level of mental performance (Fink et. all., 2018). For 90 minutes or more soccer players have to concentrate and focus on many things and keep up their mental performance high which is related to their HRV and coherence. It's known that HRV training and breathing exercises have positive effects on the autonomic nervous system (Raghuraj et. all., 1998; Pal & Velkumary, 2004; Russo et. all., 2017). In addition, the body position also influences the autonomic nerve system, HRV, and coherence (McLaughlin et. all., 1978; Ko et. all., 2008). In a soccer match or training, there are times when players can do short breathing exercises and players have half-time breaks to do HRV training with any postural position. This could be a great opportunity for soccer players to bring their autonomic nervous system to balance. In different terms, soccer players can be more coherent if they use these times to do quick breathing exercises.

According to the information above the purpose of this study is to determine the acute effect of breathing exercises on soccer players' HRV while lying down on a zero-gravity chair.

METHODS

Research Design

Quantitative research design and crossover experimental method were preferred during the study. Crossover experiments are designed to have a balance where all subjects receive the same application and participate for the same time and number of periods (Lui, 2016).

Research Group

The research group is consisting of 12 actively licensed male soccer players in Denizli/Turkey. A purposive voluntary sampling method was preferred. The criterion is that the players must be licensed football players for at least 5 years and have no knowledge and experience in mental training or breathing techniques.

Data Collection Tools

Inner Balance HeartMath: this is an innovative approach to improving emotional well-being. It teaches you to change your heart rhythm pattern to create physiological coherence; a scientifically measurable state characterized by increased order and harmony in our mind, emotions, and body. This wearable technology gives you HRV coherence feedback in real-time and over time. Inner Balance Bluetooth uses BT4.0 (BLE-Bluetooth Low Energy) which works at an output power range of 0.5 milliwatts (mW) or less, this is lower than mobile phones which have output levels between 250 mW and 2000 mW. The tiny Bluetooth emitter is attached to the garment near the heart and the small clip with the sensor is attached to the left earlobe. It could be connected to any smart device via Bluetooth. It gives quantitative data about the HRV (coherence). This device can be charged and used for long hours (Thapliyal et all., 2017; HeartMath.com).

(HeartMath.com)

Figure 1. Inner Balance HeartMath Bluetooth and Android Application

Zero Gravity Chair: This foldable and portable special chair does not collect any data, but it allows being in the best body position for HRV measurements. ZGC (zero gravity chair) can be used as a more convenient, comfortable, secure, stable, and safer option to do HRV analysis (Dehghanojamahalleh et. all., 2020).

(amazon.com)

Figure 2. Zero Gravity Chair (ZGC)

Procedures

First, soccer players were voluntarily invited to Pamukkale University Faculty of Sports Sciences Psychophysiology Laboratory and informed about the study. Consent forms were filled in and signed by the participants and researcher. Confounding variables were minimized there was no one else in the room other than the researcher. Also, there weren't any noises or objects around that would affect the participant. Inner Balance HeartMath Bluetooth device was used to collect data (see Figure 1). The first measurements (Pre-test) were made while soccer players sat in a normal chair position (upright) for 5 minutes without doing any extra breathing exercises. After the first measurement participants were informed and thought how to breathe using the diaphragm and then they were transferred to Zero Gravity Chair and asked to inhale in 4 seconds and exhale in 4 seconds using the diaphragm (4X4 HRV Breathing Exercise). The eyes were open during all measurements, and only the body position changed, a zero gravity chair was used and breathing exercises were done during the second measurement (post-test).

Statistical Analyses

To analyze the data SPSS 24 was used. The Shapiro-Wilk test was used to determine the normality of the distribution because the number of participants is less than 50. Paired sample t-test was used to compare pre-and pos-test results.

FINDINGS

Table 1.1. *Demographic Information of The Research Group*

Player Nick Name	**Age**	**Soccer Age**	**Position**	**Gender**
Nuri	21	6	Goalkeeper	Male
Benhur	26	10	Striker	Male
Arda	18	7	Mid Field	Male
Umut	24	9	Defense	Male
Efe	21	5	Defense	Male
Serkan	22	8	Mid Field	Male
Hakan	21	6	Mid Field	Male
Ali	21	7	Defense	Male
Can	22	8	Defense	Male
Deniz	23	7	Striker	Male
Ahmet	21	6	Defense	Male
Kenan	30	14	Mid Field	Male
Mean	**20,7**	**7,15**		

The research group consists of 12 soccer players (N=12). Every soccer player has been given a nickname. The age mean of the soccer players is 20.7. In addition, soccer players have been playing soccer (soccer age) for 7,15. Which is defined as the soccer age.

Table 1.2. *T-Test Results of Heart Rate Variability of Soccer Players*

	N	Mean x̄ Coherence	SD ±	t	p
HRV While Sitting *(Pretest)*	12	1,2250	0,30785	-7,977	0,000
HRV While Breathing on ZGC *(Posttest)*	12	2,5083	0,73911		

The pretest coherence levels of soccer players are x̄=1,2250 while posttests results are x̄=2,5083. The results have shown that there is a significant difference between pretest and post-test results.

DISCUSSION

The results of the study have shown that the zero-gravity chair and breathing exercises have an acute effect on soccer players' coherence. During the posttest, soccer players had a low coherence (1,2250) while sitting in a normal upright position. However, when they lay down on the zero-gravity chair and asked to do breathing exercise their coherence level increased to 2,5083. The academic literature shows that zero gravity chair influences the autonomic nervous system and HRV positively (Dehghanojamahalleh et. all., 2020). Dehghanojamahalleh et. all. (2020) also claims that a zero gravity chair (ZGC) could be a better alternative because it can be used as a more convenient, secure, stable, and safer option than the traditional HRV analysis. Another study has proven that postural position affects the autonomic nervous system (Ko et. all., 2008). This is very important because it is known that the autonomic nervous system is related to HRV which affects the coherence of an individual (Nuuttila et. all., 2017).

This study has shown that the results are parallel with the literature, HRV training and the position of the body affect the autonomic nervous system. However, studies about zero gravity chairs and HRV related to athletes are limited in sports literature. On the other hand, HRV studies related to athletes' physical and mental performance are widespread (Perry et. all., 2019). Boullosa et. all., (2013) claim that the practice of night-time HRV results in autonomic adaptation in professional soccer players. This study was applied to long-term soccer players which have a chronic effect on soccer players. Our recent study has also proved that HRV training, especially using zero gravity chairs also has an acute effect on soccer players'

autonomic nerve system. According to the literature and this recent study, HRV training could increase soccer players' coherence acutely and chronically. If these results are taken into consideration HRV training using zero gravity chairs could be a new way of recovering soccer players mentally and physically. Imagine a soccer team going in to break room after the first half of the match. They are losing 1-0 and the match is very intense and stressful all they need to do is calm down and manage their stress. This is where the zero-gravity chair comes in supported with HRV breathing exercises. If soccer players or coaches use zero gravity chairs and HRV breathing exercises they could see the benefits in the long or short term easily. Because it's scientifically known that when an individual is coherent and their autumn nerve system is in balance they perform better mentally and physically (Elbers & McCraty, 2020).

CONCLUSION

In conclusion, the results of the study have proven that when HRV breathing exercises are supported with a zero gravity chair it brings the autonomic nervous system of the soccer players into balance and their coherence levels increase significantly. In simple words, after applying the breathing exercise on zero gravity chair soccer players feel better mentally and physically. This could be an effective way to manage stress and perform better mentally and physically for soccer players considering soccer is a multifunctional and intense game.

LIMITATIONS

- This study is limited to 12 soccer players.
- This study is limited to the acute effect experimental method.
- Data collection is limited with Inner Balance Heart Math Biofeedback Device

RECOMMENDATIONS

- This study could be done on different sports branches and more athletes.
- Zero gravity chairs could be used by soccer clubs.
- Meditation and mental training rooms could be part of the changing room.
- Zero gravity chair and HRV breathing exercises should be combined for better results.

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Examination of Competitive State Anxiety Scores of 12-year-old Tennis Players by Gender

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Abstract

The purpose of the current study was to examine the differences of competitive state anxiety scores of 12-year-old tennis players by gender. A total of 50 licensed tennis players, 20 girls and 30 boys, participated in the study. Participants filled the Children's Form of the Competitive State Anxiety Inventory (CSAI-2C) until 20 minutes before the official competition started. Their cognitive anxiety, somatic anxiety and self-confidence scores were recorded. According to the results, no significant difference was found in any of the subscales of CSAI-2C between boys and girls. Similar results were found in correlation analyzes. In both groups, a positive relationship was observed between cognitive and somatic anxiety, and a negative relationship between cognitive and somatic anxiety and self-confidence. When the results were examined, it was understood that the CSAI-2C results were not affected by gender. Cognitive and somatic anxiety scores of the participants were found to be moderate and self-confidence scores were high. In addition, it was understood that as cognitive and somatic anxiety scores decreased, self-confidence increased.

Key Words: Anxiety, cognitive anxiety, somatic anxiety, self-confidence, tennis

INTRODUCTION

In addition to the fact that anxiety and anxiety disorders are the most common psychological disorders and this affects the quality of life negatively (1, 2), there are studies in the literature showing that exercise reduces anxiety (3, 4, 5) and, more importantly, that high anxiety levels negatively affect athletic performance (6, 7, 8).

Anxiety in sports has been defined in different ways. According to Cox, anxiety is a state of increased physiological arousal and subjective anxiety (9). According to Weinberg and Gould (1995), it describes an emotional state related to feelings of nervousness, anxiety and distress that occur with the arousal of the body (10). Anshel and Kaissidis (1997) defined anxiety as

perceived threat (11). Horn (1992) expressed it as the cognitive dimension or emotional effect of arousal (12). In order to improve a concept that is effective on sports performance, it must first be measured and evaluated objectively.

For this reason, many inventories have been developed to determine anxiety in sport. However, in this study, the Children's Form of Competitive Sports Anxiety Inventory (CSAI-2C) was used because it was multidimensional and suitable for the age group of the participants, since it was desired to determine the state anxiety of young athletes before the competition. This inventory can measure cognitive and somatic anxiety parameters that affect human motor and cognitive behaviors, as well as self-confidence (13, 14). Smith and Smoll (1991) especially emphasized that competition anxiety is one of the causes of behavioral changes in children and young athletes (7). Similarly, Woodman and Hardy (2003) stated in their meta-analysis study that cognitive anxiety and self-confidence affect sports performance (8).

The aim of the current study is to compare the cognitive anxiety, somatic anxiety and self-confidence level of 12-year-old boy and girl tennis players, and examine the relationship between anxiety and self-confidence levels.

METHODS

Study Design

This research was conducted to compare the competitive state anxiety levels and self-confidence levels of 12-year-old male and female tennis players before an official competition.

Subjects

A total of 50 (30 male, 20 female) licensed competitive tennis players with a mean age of 12.02 ± 1.61 participated in the study. Participants were included in the study on a voluntary basis from sports clubs in Ankara. Inclusion criteria for the study; to participate in regular tennis trainings for at least the last 6 months, to be a competitor and not to have any musculoskeletal or respiratory disorders.

Procedures

The original Competitive Sport Anxiety Inventory scale used in this study was developed by Martens, Burton, Vealey, Bump, and Smith (1990). This inventory was revised by Martens, Vealey and Buton in 1982 and was named CSAI-2. The version of the scale that can be used for children aged 12 was developed as Children’s Form of Competitive Sport Anxiety Inventory

(CSAI-2C) by Stadulis, MacCracken, Eidson and Severance in 2002. CSAI-2C includes cognitive anxiety, somatic anxiety and self-confidence subscales and consists of a total of 15 items. All items in the inventory are of four-point Likert type (not at all, somewhat, so and much so). Questions 1, 7, 10, 12 and 14 meet cognitive anxiety, questions 2, 4, 8, 11 and 15 meet bodily anxiety, and questions 3, 5, 6, 9 and 13 meet the self-confidence subscale. The inventory was adapted into Turkish by Koruç and Yılmaz (2004). The Carmine Internal Consistency measurement of the original inventory was found to be 0.96, while the Cronbach Alpha Internal Consistency Coefficient was found to be 0.75 for cognitive anxiety, 0.78 for somatic anxiety and 0.73 for self-confidence. In the Turkish version, the Cronbach Alpha Internal Consistency Coefficient is 0.80 for cognitive anxiety, 0.87 for somatic anxiety and 0.85 for self-confidence.

The inventory was given to all participants 20 minutes before the start of the competition and it was provided to be filled in a quiet room.

Statistical Analyses

SPSS 22 program (SPSS, Chicago, IL, USA) was used for data analysis. First, the distribution of the data was analyzed with the Shapiro-Wilk test, and the mean comparison of each sub-dimension according to the sport gender variable was analyzed with the Independent-Samples t Test or the Mann-Whitney U Test according to the normality of the distribution. Correlation analysis was performed with Spearman correlation test since most of the data did not show normal distribution. The alpha value of 0.05 was accepted for all statistical analyses.

FINDINGS

Table 1. The averages of cognitive anxiety, somatic anxiety and self-confidence subscales obtained depending on the gender variable of the participants and the differences between the averages.

Children's Form of Competitive Sport Anxiety Inventory (CSAI-2C)		
Boys	**Girls**	***p*_**
Cognitive anxiety		
10.13 ± 2.81	9.55 ± 2.68	0.468
Somatic anxiety		
10.47 ± 3.20	10.30 ± 3.06	0.855
Self-confidence		
15.60 ± 2.37	15.20 ± 3.53	0.998

According to the results, no significant gender difference was found in the cognitive anxiety, somatic anxiety and self-confidence subscales of the inventory.

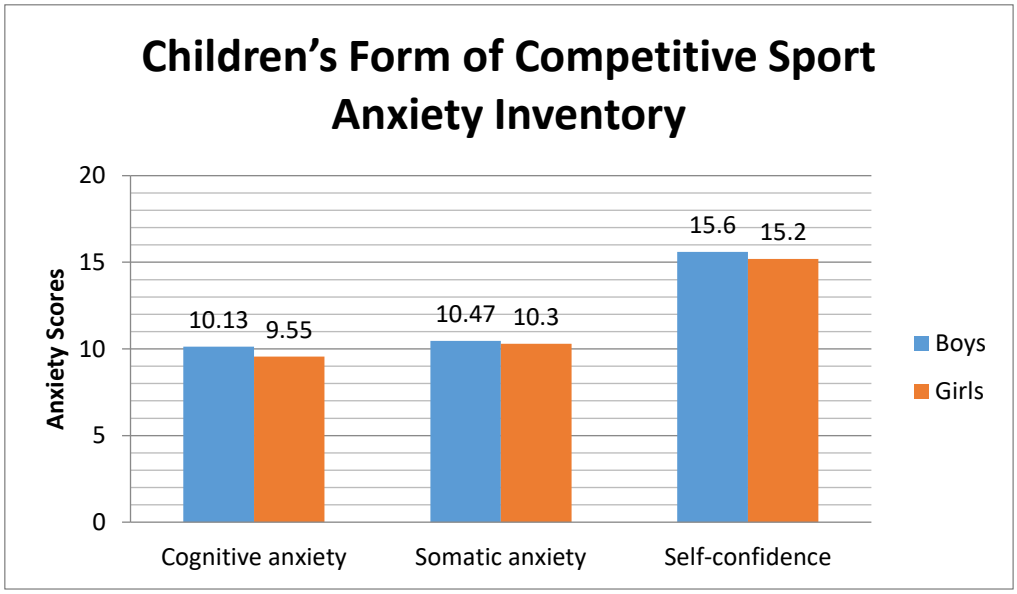

Figure 1. Graph of the averages of cognitive anxiety, somatic anxiety and self-confidence subscales obtained depending on the gender variable of the participants.

As a result of the correlation analysis, there was a positive relationship between cognitive anxiety and somatic anxiety in both boys and girls ($p< 0.01$). A negative relationship between cognitive anxiety and self-confidence ($p< 0.01$), and somatic anxiety and self-confidence were observed again in both boys and girls ($p< 0.01$ in boys, and $p<0.05$ in girls).

DISCUSSION

The purpose of this research was to compare the results of competitive state cognitive and somatic anxiety and self-confidence scores of 12-year-old male and female tennis players, and examine the relationship among two different anxiety types and self-confidence. In order to understand the gender differences, the CSAI-2C was given to the participants until 20 minutes before the competition, and they were provided to fill the inventory in a quiet room. When the results were investigated it was seen that gender is not determinant factor. Both male and female young tennis players showed similar results. They all had a moderate level of cognitive and somatic anxiety levels, and a high level of self-confidence. The correlation results also showed gender-independent results. There was a positive significant relationship between cognitive and somatic anxiety in both groups. Similarly, a significant negative relationship was observed between both anxiety scores and self-confidence level in male ($p<0.01$) and also female ($p<0.05$) young tennis players.

In general, it is argued that high anxiety level has negative effects on athletic performance. From this perpective, Raglin (1992) stated in his review study that athletes should develop techniques to cope with anxiety in order to avoid the negative effects of increased anxiety on sportive performance. He also suggested that measuring and evaluating anxiety level not only before the competition but also during the competition would be effective (15). For this reason, it is seen that different interventions and applications are used to reduce the anxiety level of athletes.

In a study Salleh et al. (2021) investigated the effects of probiotics on anxiety and performance in badminton players. They used the CSAI-2 to determine the anxiety level of young adult athletes. After six weeks of probiotics consumption, they found a 16% decreased in anxiety level, besides a 5.9% increase in aerobic power (16). In another study Scott-Hamilton et al. (2016) measured the effectiveness of mindfulness practice on anxiety of competitive cyclists. At the end of the eight-week mindfulness intervention they recorded significant decrease in anxiety scores (17). As a different strategy, Englert and Bertrams (2012) examined the effects of self-control exercise on anxiety and how it would affect sports performance. In their study, in which they evaluated the performance on free throws in basketball and dart task, they stated that self-control strength reduces the negative effects of anxiety and affects performance positively (18). Lastly, Hazell et al. (2014) focused on the effects of pre-performance routines on performance and anxiety levels in semi -professional soccer players. The researchers stated that pre-performance routines affect the performance positively and also reduce the somatic anxiety (19).

CONCLUSION

This research is important because it is a study that evaluates the anxiety level of 12-year-old tennis players on the basis of gender parameter. When the results were examined, it was understood that the CSAI-2C results were not affected by gender in this age group. Cognitive anxiety, somatic anxiety and self-confidence scores were found to be similar. However, it was seen that the anxiety scores obtained were at a moderate level in this age group, and the self-confidence scores were high. Similarly, similar changes were observed in both genders in the correlation analyzes, a positive relationship between cognitive and somatic anxiety scores and a negative relationship between anxiety scores and self-confidence was recorded. Comparing state anxiety with competitive success and overall year-round success in future studies may provide a clearer comparison of anxiety and self-confidence scores. In addition, when the studies mentioned in the Discussion section are examined, it is seen that many different

approaches have been applied to reduce the level of high-level anxiety. However, it is understood that the positive effects obtained in these studies should be standardized in order to be applied in the field. Therefore, more studies on the subject are needed.

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Comparison of Mental Toughness Levels of Soccer and Rugby Players

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Abstract

The concept of mental toughness, which is defined as the ability of sportsmen to cope with mentally challenging situations better than their competitors, is an important concept for achieving success in sports. Mental toughness can vary according to age, sport year, branch, gender and many other factors. Although the soccer branch is the most popular branch in the world, its starting point comes to the same period with rugby. In recent years, the increasing interest in rugby in our country and the success of Turkish rugby teams in international platforms is also a striking factor. The aim of our research is to compare the mental toughness levels of soccer and rugby sportsmen in Turkey. The research group consist of 119 soccer players and 81 rugby players. To collect data Sport Mental Toughness Questionnaire (SMTQ) was used online. The results have shown that there is significant difference between soccer players and rugby players mental toughness levels.

Keywords: Football, Rugby, Mental Toughness, Soccer

INTRODUCTION

Around the world, there are many soccer and similar team sports. However, these sports may be differed from country to country and culture to culture such as Rugby, American Football Australian Football. When looking at the historical development process of similar team sports, most of these branches are based on soccer (4).

Although soccer has been around since 200–300 B.C., England did not adopt the modern version until the 17th century. While soccer's historical evolution differed from culture to culture, it was played in Britain's villages and cities for socializing and in Rome as gladiator training. (13).

In the beginning, soccer, which was played with a round ball made of leather and some hair pieces, without certain rules, has become an indispensable sports branch for societies. Football, which has been played in different ways in the process, has given rise to branches such as American football and rugby as a result of the fact that every part of the body was free to use before it took on its current rules, and that these rules were not accepted or found less entertaining in various regions with the introduction of written rules. Founded on 26 October 1863 after the meeting held on 26 October 1863, The Football Association ('FA') wrote the first rules of today's football and shaped football (9,17).

In addition to football being the most popular sports branch in our country, rugby is a developing branch that has started to attract attention. The fact that Turkish society has a fighting spirit is reflected in the sports culture and the fact that rugby branch also includes a struggle and is economical in terms of materials and equipment has made it easier for this branch to be accepted in our country. Rugby is in a great development process in Turkey and today it is seen that it is fought in national, local and university leagues (19).

The growth of the sports industry, the professionalization of people for reasons other than socialization, and the potential to profit financially from these areas have all contributed to the sector's transformation. Athletes have started to realize that they need to be mentally prepared for competitions in addition to preparations such as physical preparation, nutrition and individual training in their professionalism processes. This process, which includes different mental training processes from branch to branch, has positive effects on the performance of athletes. Many studies conducted in this field have shown that athletes are affected by different external factors and reflect them to the field unintentionally (2).

Considering the historical process, the starting points of rugby and football branches are similar. Even though these two branches have the same origin, it is known that they require different mental and physical characteristics and skills. However, when football and rugby are compared, it is seen that rugby is harder and involves more physical contact (8).

While many factors determine the performance of athletes in sports competitions, the concept of mental toughness is one of the most important concepts. Sport psychology, which scholars try to define in different ways, is considered as an important factor for coaches and especially athletes to achieve peak performance (6).

Mental toughness can be defined as a developed or natural psychological ability that enables a person to focus, manage stress, maintain performance under pressure, feel safe and maintain these during competition or training (3).

Athletes can improve their mental abilities with correct and regular mental training as well as physical training. In cases where conditional and physical characteristics are equal, the factor that reveals the difference between athletes during the competition is their mental toughness levels (18). In this context, it is thought that rugby players should be mentally as well as physically resilient.

As a result of these factors, the aim of our study is to compare the mental toughness levels of footballers and rugby players. In our research, the following hypotheses were tested.

What are the mental toughness levels of football and rugby players; is there a difference between the branches? In this context, answers to the following problem will be sought;

Is there a significant difference between the level of mental toughness of football and rugby players?

Is there a significant difference between the level of mental toughness of football and rugby players according to the reason for doing sports, age, and sports age?

METHODS

Research Model

In our study in which the mental toughness levels of football and rugby players were compared, the survey model, one of the quantitative research models, was used.

Population and Sample of the Research

The population of our research consists of amateur football players in Denizli, Izmir and Istanbul provinces and rugby players in the 'Turkish Rugby Federation' throughout Turkey. The sample of the research consists of a total of 200 athletes, 119 of whom are football players and 81 of whom are rugby players.

Data Collection and Tool

Personal information form and "Sport Mental Toughness Questionnaire-(SMTQ)" developed by Sheard et al. (2009) and adapted into Turkish by Altıntaş (2015) was used to determine the mental toughness levels of the athletes. The data was collected online.

Personal Information Form

The personal information form was used to determine the demographic information of the participants. In the personal information form, there are questions such as gender, age, education status, branch, year of doing sports and reason for doing sports.

Analysing Data

The data were analyzed in SPSS 25.00 package program. Data was analyzed whether the data showed normal distribution and parametric tests were deemed appropriate. Frequency and mean values were used as the analysis method. Cronbach's Alpha value (0,741). T-test for independent groups and Anova test for multiple comparisons were used.

FINDINGS

Table 1. Distribution of demographic information of participants.

Personal Data	Variable	F	%
Gender	Male	179	89,5
	Woman	21	10,5
Age	18-22	135	67,5
	23-26	41	20,5
	27 and over	24	12,0
Education Status	High School	120	60,0
	Bachelor	75	37,5
	Postgraduate	5	2,5
Branch	Football	119	59,5
	Rugby	81	40,5
Sports Age	1-3 Year	92	46,0
	4-8 Year	59	29,5
	9 and over	49	24,5
Reason for Doing Sports	Hobby	69	34,5
	Health	90	45,0
	Money	41	20,5

According to Table 1, 89.5% of the participants are male and 10.5% are female. Regarding the age variable, 67.5% of the participants are 18-22 years old, 20.5% are 23-26 years old, and 12.0% are 27 and over. Educational status variable, 60.0% of the participants have high school education, 37.5% have undergraduate education and 2.5% have postgraduate education. When the branch variable is analyzed, 59.5% of the participants are interested in football and 40.5% in rugby. When the sport age variable is analyzed, 46.0% of the participants have a sport history of 1-3 years, 29.5% of the participants have a sport history of 4-8 years and 24.5% of the participants have a sport history of 9 or more years. When the reason for doing sports was analyzed, it was seen that 34.5% of the participants do sports as a hobby, 45.0% for health and 20.5% to earn money.

Table 2. T-test analysis results mental toughness levels of soccer and rugby players

Format	Branch	N	X	Sd	T	P
Mental	Football	119	43,5630	5,8652	2,434	0,016*
Toughness	Rugby	81	41,5432	5,60591		

***P<0.05**

Table 2 shows that that there is a significant difference between the mental toughness levels soccer and rugby players ($p<0.05$). Soccer players have higher mental toughness score than rugby players.

Table 3. Anova test results according to the age of the participants

Format	Age	N	X	Sd	P	Significant Difference
Mental Toughness	18-22[a]	135	41,8593	5,55859	0,005*	a < c
	23-26[b]	41	43,8537	6,38968		
	27 Over[c]	24	45,8333	5,15555		

***P<0.05**

When Table 3 was analyzed, it was determined that there was a significant difference between the age variable of the participants and their mental toughness levels ($p<0.05$). This difference was found to be between the participants aged 18-22 years and the participants aged over 27 years.

Table 4. Results of Anova According to reason for doing sports

Format	Reason for doing sport	N	X	Sd	P	Significant Difference
Mental Toughness	Hobby[a]	69	40,9420	5,40393	,003*	a<b a<c
	Health[b]	90	43,2333	5,84836		
	Making Money[c]	41	44,7073	5,78033		

***P<0.05**

When Table 4 was analyzed, it was found that there was a significant difference between the participants' reason for doing sports and their mental toughness levels ($p<0.05$). This difference was found to be between the participants who do sports for hobby, health and making money.

Table 5. Anova test results according to sports age

Format	Year of Sport	N	X	Sd	P	Significant Difference
Mental Toughness	1-3 Year[a]	92	41,2717	5,59651	,000*	a <c c>b
	4-8 Year[b]	59	42,5424	5,56876		
	9 and Over[c]	49	45,7551	5,54350		

***P<0.05**

In Table 5, it was found that there was a significant difference between the participants' sport years and their mental toughness levels ($p<0.05$). This difference was found to be between the participants who have been doing sports for 1-3 years and 9 and over, 9 years and over and 4-8 years.

DISCUSSION

This study was conducted to determine the mental toughness levels of football players and rugby players in Turkey and to examine them according to different variables. Statistically significant differences were found between the results and variables such as age, branch, sport age and reasons for doing sport.

In this study, a statistically significant difference was found when the branches of the participants were taken into consideration. It was seen that the mental toughness total score of the participants interested in football branch was higher than the mental toughness score of the

participants interested in rugby branch. As a result of the research, it was seen that the mental toughness comparison studies of football players and rugby players were limited. However, many studies were found in comparisons in different sports branches and mental toughness may differ according to sports branches (1, 12, 15, 16). When the literature was examined, it was revealed that the mental toughness levels of rugby athletes were higher in countries where rugby was popular (7).

In our study, it was revealed that there were statistically significant differences between the mental toughness levels of our participant athletes when the age variable was examined. This difference was seen between our participants aged 18-22 years and 27 and over. Participants aged 27 and over were found to have the highest total mental toughness score. In the study conducted by Connaughton et al. (2008), it was seen that the mental toughness level increased as the age of the athlete increased. This study supports our research.

When the reason for doing sports was analysed, significant differences were found between the mental toughness levels of our participants. The mental toughness levels of the athletes who do sports for hobby were found to be the lowest. Significant differences emerged between the athletes who participated in sports for hobby purposes and the participants who did sports for health and making money. While the mental toughness levels of the athletes who performed the sport for making money were the highest, a significant difference emerged between the athletes who performed the sport only for hobby purposes. When the literature was examined, significant differences were found between athletes who played sports according to different variables (10). This research supports our study.

When the sport age variable of our participant athletes was analysed, significant differences were found between their mental toughness levels. In our research, the mental toughness levels of our athletes with a sports age of 9 and over years were found to be at the highest level. These findings revealed a significant difference between athletes with a sporting age of 9 and over and participants with a sporting age of 1-3 years and 4-8 years. Although the mental toughness levels of our participant athletes with a sport age of 1-3 years were at the lowest level, a significant difference emerged only between the athlete participants who played sports between 9 and over years. When the literature is analysed, many studies have revealed that the increase in sports age has a positive effect on mental toughness levels (5, 14).

The fact that the soccer players who participated in our study averaged 4 to 8 years of age of sports, whereas the rugby players averaged 1 to 3 years sports age, probably has implications

for the mental toughness levels of the rugby players. It is not surprising that the result would be so. Studies in literature suggest that the level of mental toughness increases with increasing years of sport and age of athletes (11, 12).

CONCLUSION

As a result, there was a statistically significant difference between the branch variable and the mental toughness levels of the athletes participating in our research. In this context, the hypothesis of our research was confirmed. When the literature was analyzed, it was found that the mental toughness levels of rugby players were high in countries where rugby was popular (7). In this study, it can be said that the reason why the mental toughness levels of football players are higher than rugby players is because the rugby branch is new in our country.

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