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The Association of Physiological and Physical Parameters of Athletes in Different Sports with Multiple Intelligences*

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Abstract

The aim of this study was to determine the association of the physiological and physical parameters of athletes in different sports with multiple intelligences. A total of 120 athletes participated voluntarily in the study. In the study, the Multiple Intelligence Self Evaluation Scale, which was developed by Howard Gardner, and the validity and reliability study in Turkish was conducted by Gonce Seber, was administered to the students to determine the distribution of the types of multiple intelligences. The physical measurements of students such as height, age and body weight and their movement measurements such as flexibility, static balance, standing long jump, grip strength, hanging with bent arm, 20 m endurance shuttle run, plate tapping, 10 x 5 m shuttle run and skin fold (biceps, triceps, subscapular, suprailiac, calf) measurements. 30-second sit-up tests were also carried out. As a result, the physiological and physical parameters of the badminton, swimming, taekwondo and football athletes showed the lowest total score was found to be "Balance". The distribution of the physiological and physical parameters scores of the athletes in all of the sports included in the study was as follows: "left hand grip", "right hand grip", "fat percentage", "flexibility", "30 seconds of sit-ups", "shuttle run 20 m", "disc", "hanging with bent arm", "long jump" and "shuttle", respectively. The highest total score for intra-personal intelligence was obtained in badminton and football, while the highest total score for logical intelligence was obtained in swimming and taekwondo. The intelligence type that had the lowest total score in all of the sports was musical intelligence.

Keywords: Multiple intelligences, Eurofit test battery, football, taekwondo

* *This study was generated from the master's thesis written by Duygu SEVİNÇ with the counseling of thesis advisor, Dr. Erdinç ŞIKTAR.*

Introduction

Scientist conducting studies on philosophy, sociology and psychology have addressed the topic of intelligence in their research. Scientists in the fields of education and medicine have also participated in these studies and wanted to define intelligence (Saban, 2005).The examination of intelligence has provided resources for studies in the field of education for a long time. Educators have developed various tests to define intelligence. The preparation stage of these tests is based on the functions and performance of human intelligence. Intelligence Quotient tests were developed as a result of these studies. Some educators have defined intelligence as a qualitative phenomenon that is assessed using tests, while others have interpreted intelligence as the ability to learn. As a result, the conventional understanding of intelligence and IQ-style thinking, individuals tended to be divided into two categories.3 The distinction between intelligent and unintelligent derives from this perspective. IQ tests were regarded as tools that help determine whether individuals are intelligent or not. In this determination stage, IQ is an invariant criterion. In addition, individuals are or are not intelligent when they are born, and there is nothing to do to change their situation within the scope of the conventional understanding (Gardner, 1993; Saban, 2002; Selçuk, Kayılı and Okut, 2004).

Theory depicts multiple intelligences as a door to the intelligence structure of individuals and describes the distinct functions of various parts of the brain. In other words, the theory of multiple intelligences explains how the human brain responds to external reactions, in what way it replies to external factors, sound and views, and how it interprets the situation. Accordingly, the examination of intelligence shows that it has the characteristic of a capacity having many aspects. Intelligence is described as potential and ability. In addition, intelligence is shaped by individuals' genetic structure and their experiences and knowledge which affect their natural and cultural environment (Saban, 2005).

Many studies have shown that individuals who receive education based on the multiple intelligence approach are more successful than those who receive conventional education, and that the education based on the multiple intelligence theory is more effective than the conventional education in terms of achievement and permanence (Akamca, 2003; Presley ve Balkaya, 2003; Yılmaz and Fer, 2003). However, there have been three main criticisms of multiple intelligence theory in recent years. The first criticism concerns the adequacy of the criteria used by Gardner. White (1998) suggested that there are problems with the criteria applied by Gardner, particularly about the individual criterion. In fact, Gardner also accepted that there is a subjective judgment here. The second criticism is about whether Gardner's way of perceiving intelligence provides integrity. It is thought that Gardner's study will be always very problematic for researchers and theorists who conventionally regard intelligence as a concept that is effectively assessed using intelligence tests. The third criticism is about whether there is adequate experimental evidence to support Gardner’s development and conceptualization of his theory. There is no perfect test available to determine and assess different intelligences. Gardner (1999: 98) expressed his opinion about this topic: "Once upon a time, I thought that developing a test for each intelligence that can be assessed independently of other intelligences was possible, but now I believe that this can be put into practice only if someone develops different criteria for each intelligence and people can easily use the methods and materials prepared to assess each intelligence."

The most appropriate method used to monitor the fitness of athletes and to confirm the effectiveness of their specific training is to conduct physical performance tests (Ball et al.

2011; Kim et al. 2011). Strength determines the efficiency of motor skills while playing sports. Strength is generally defined as the ability to counter a resistance or the ability to endure against a resistance at a specified level. Speed is one of the most important motor skills of individuals who play sports, and it can be defined in various ways. In physical aspects, speed is the distance covered in a specified time (Açıkada et al.,1991).

Endurance is the ability of all organism activities to respond to physical strain as a result of continuous sports training and their ability to maintain the intensity for a long time (Bilgisi, S. Y. A. ,2002).

Pechtl (1982) stated that the inadequate development of flexibility negatively affects the development of strength, speed and coordination. Anderson (1980) stated that although athletes develop in terms of strength, they will be unsuccessful in physical activity unless they have adequate muscular flexibility. Johnson (1969) pointed out that performance is also negatively affected by inadequate flexibility.

Coordination, in regards to sports, is the application of voluntary and involuntary movements in an orderly, compatible and goal-oriented movement sequence and the neurotic strength of the organism. In another aspect, coordination is the unity between skeletal muscles, joints, joint ligaments, which contribute to the application of movement, and the central nervous system. It is possible to categorize balance into two types: static balance and dynamic balance. In static balance, movements remain stable in their center of gravity, while the dynamic balance is the ability of keeping the balance of body while moving (Newman et al., 2004).

The aim of this study is to determine the association of the physiological and physical parameters of athletes in different sports with multiple intelligences. In accordance with this aim, an answer was sought for the following question:

What kind of relationship is there between the branches of sports selected by athletes working in different branches, according to the theory of multiple intelligences, and the types of multiple intelligences, and is there any other situation that shows significance between these relationships?

Method

In compliance with the aim of this study, a descriptive, cross-sectional research design was used. This study aimed to determine the association of the physiological and physical parameters of badminton, swimming, taekwondo and football athletes in different sports with multiple intelligences. A total of 120 athletes, including 30 badminton, 30 swimming, 30 taekwondo and 30 football athletes, participated voluntarily in this study.

The Multiple Intelligence Self Evaluation Scale, which was developed by Howard Gardner, and the validity and reliability study in Turkish was conducted by Gonce Seber, was administered to the participants to determine the distribution of the types of multiple intelligences. Also, the physical measurements of students such as height, age and body weight and their movement measurements such as flexibility, static balance, standing long jump, grip strength, hanging with bent arm, 20 m endurance shuttle run, plate tapping, 10 x 5 m shuttle run and skin fold (biceps, triceps, subscapular, suprailiac, calf) measurement. 30-second sit-up tests were also carried out.

The personal identity information of participants was used to determine their ages. Their heights were measured using a tape measure and recorded in centimeters while their body weights were measured using a weighing scale and recorded in kilograms. The sit and reach test was used to measure the flexibility of the participants. A sit and reach box was used for the measurement of flexibility. The participants were asked to stretch their bodies forward and hold for 1 or 2 seconds at the most distant point, and this point was recorded as test results. A plate tapping test was used to measure the speed of arm movement. The subjects touched the plastic discs A and B (20 cm diameter), placed with their centers 80 cm apart on the table, using their dominant hands 25 times as quickly as possible. After this, the stopwatch was stopped, and the time taken to complete 25 touches was recorded. The flamingo balance test was carried out to measure body balance. A board 50 cm long, 4 cm high and 3 cm wide was used. The number of trials necessary for the subjects to stand on the balance board for 1 minute was recorded as the test result. For the standing long jump test, the subjects stood with their feet together and toes behind a line marked on the ground. They jumped as far as possible through bending their knees and swinging both of their arms backward to provide forward drive. Two jumps were made and the best one was recorded as the longest distance jumped. To measure the endurance of the abdominal muscles of the subjects, the sit-up measurement was carried out. The subjects lay on their back with their fingers interlocked behind their heads, their knees bent at right angles, with their feet flat on the floor. While raising their chests, they touched their knees moving their elbows forward. They performed sit-ups as fast as possible for 30 seconds, and the number of sit-ups was recorded as the test result. The bent arm hanging test was used to measure the arm strength of the subjects. The subjects stood under a horizontal bar, held on to the bar with their hands shoulder width apart, with a regular grip, and lifted their body until their chins were above the level of the bar. They continued holding this position as long as possible without resting their chin on the bar. The test was finished when they could no longer maintain this position and lowered their eyes to the level of the bar. Total time was recorded in seconds. Subcutaneous fat was measured in millimeters by using a skinfold caliper on six sites of the body including biceps, triceps, abdominal, subscapular, suprailiac and calf. The grip strength of the subjects was measured in kilograms for their right and left hands using a handgrip dynamometer. Also, 10 x 5 m shuttle run tests and shuttle run tests (ml/kg/min) were carried out.

The data were assessed by using the SPSS statistical package program. For the assessment of the data, descriptive statistics such as the frequency distribution, percent (%) values, mean and standard deviation were calculated, and the correlation statistics were used to determine the relationships between various variables.

Findings

The subdimensions of multiple intelligence types were examined and standard deviation points were given for each sports branch.

Table 1. Mean and Standard Deviation Scores of the Multiple Intelligence Scale Subdimensions

Branches		Verbal linguistic	Logical	Visual	Musical	Bodily	social	intra-personal	naturalist
Badminton	Mean	3,7433	3,9526	3,6141	3,1970	3,9659	4,0504	4,1489	3,8063
	N	30	30	30	30	30	30	30	30
	Sd.deviation	,62515	,55404	,70442	,94129	,72384	,59463	,54495	,95442
Swimming	Mean	4,1567	4,2267	3,8126	3,2400	4,1200	4,1533	4,0837	4,0067
	N	30	30	30	30	30	30	30	30
	Sd.deviation	,64737	,70805	,76600	,99155	,76085	,66630	,80392	,78474
Taekwondo	Mean	4,2963	4,3767	4,0459	3,6967	4,2897	4,3000	4,2342	3,9407
	N	30	30	30	30	29	30	30	30
	Sd.deviation	,54949	,54437	,64075	,84056	,57093	,48778	,60002	,92064
Football	Mean	3,6675	3,6000	3,4124	2,8874	3,7011	3,8633	4,0233	3,5100
	N	30	30	30	30	30	30	30	30
	Sd.deviation	,68365	,87966	,69219	,98680	,74682	,81684	,75186	,82100
Total	Mean	3,9659	4,0390	3,7212	3,2553	4,0169	4,0918	4,1225	3,8159
	N	120	120	120	120	119	120	120	120
	Sd.deviation	,67564	,73882	,73236	,97425	,72970	,66364	,67937	,88294

The intelligence type that the badminton, swimming, taekwondo and football athletes obtained the lowest total score on was Musical Intelligence (Table 1).

Table 2. The Correlation Scores of Multiple Intelligence Types and Physical Parameters

		10x5m shuttle run	Static balance	plate tapping	Flexibility	standing long jump	right grip strength	Left grip strength	30-second sit-up	hanging with bent arm	20m endurance shuttle run
Verbal linguistic intelligence	Pearson Correlation	-,023	-,163	,053	,053	,009	,094	,120	,120	,015	,142
	Sig. (2-tailed)	,806	,075	,569	,568	,921	,308	,192	,190	,872	,122
	N	120	120	120	120	120	120	120	120	120	120
Logical intelligence	Pearson Correlation	-,060	-,124	,090	,005	-,070	,122	,164	,132	,064	,072
	Sig. (2-tailed)	,518	,178	,330	,955	,450	,183	,074	,150	,489	,431
	N	120	120	120	120	120	120	120	120	120	120
Visual intelligence	Pearson Correlation	-,131	-,114	-,016	,036	,013	,156	,156	,050	-,062	,159
	Sig. (2-tailed)	,153	,214	,860	,699	,892	,089	,090	,591	,501	,082
	N	120	120	120	120	120	120	120	120	120	120
Musical intelligence	Pearson Correlation	-,084	,023	-,098	,082	,052	,145	,164	,094	,048	,093
	Sig. (2-tailed)	,361	,803	,288	,375	,576	,114	,073	,306	,604	,313
	N	120	120	120	120	120	120	120	120	120	120
Bodily intelligence	Pearson Correlation	-,073	-,114	,007	-,032	-,013	,109	,138	,149	-,029	,108
	Sig. (2-tailed)	,429	,217	,944	,733	,885	,237	,134	,106	,757	,243
	N	119	119	119	119	119	119	119	119	119	119
Social intelligence	Pearson Correlation	-,017	-,033	-,010	,018	,051	,163	,181	,091	,068	,072
	Sig. (2-tailed)	,857	,721	,917	,842	,582	,074	,048	,320	,461	,437
	N	120	120	120	120	120	120	120	120	120	120
Intra-personal intelligence	Pearson Correlation	-,080	-,118	,012	-,116	,006	,093	,071	,010	,019	,006
	Sig. (2-tailed)	,383	,201	,894	,207	,947	,311	,443	,917	,835	,947
	N	120	120	120	120	120	120	120	120	120	120
Naturalist intelligence	Pearson Correlation	-,041	,071	,125	-,079	-,067	,049	,076	,013	-,093	,037
	Sig. (2-tailed)	,657	,442	,173	,392	,468	,596	,408	,887	,314	,687
	N	120	120	120	120	120	120	120	120	120	120
Fat Percentage	Pearson Correlation	,103	-,010	,155	-,152	-,032	,011	,037	,014	-,020	-,040
	Sig. (2-tailed)	,265	,915	,091	,097	,725	,907	,686	,880	,827	,665
	N	120	120	120	120	120	120	120	120	120	120

This table shows that there is a very weak, negative, weak negative, very weak positive, weak positive linear relationship between the intelligence types and the physical parameters of the athletes.

Table 3. Sports Branch and Physical — Physiological Parameters

Branches		10 x 5 m shuttle run	Flexibility	Fat Percentage	20m shuttle run	Hanging with bent arm	30-second sit-up	plate tapping	Left grip strength	Right grip strength	Standing long jump	Static balance
Taekwondo	Mean	246,1667	24,9000	18,7997	48,2387	320,3000	28,5667	137,2667	18,2000	19,8000	185,4000	1,1000
	N	30	30	30	30	30	30	30	30	30	30	30
	Sd.deviation	96,92019	4,83771	5,42703	9,44836	140,43483	6,38254	17,69265	5,89213	5,86868	29,10575	1,06188
Football	Mean	318,8667	19,1333	20,1953	30,5151	86,6667	21,7000	151,2000	16,7000	18,8333	174,0667	3,1000
	N	30	30	30	30	30	30	30	30	30	30	30
	Sd.deviation	33,76055	5,69775	4,33922	6,29498	143,55903	4,17835	32,68175	5,50329	5,08604	30,79289	3,55596
Badminton	Mean	328,2667	17,1000		21,9070	111,8333	23,6000	173,2000	18,6000	19,5667	165,9333	5,3667
	N	30	30		30	30	30	30	30	30	30	30
	Sd.deviation	33,88106	5,90353		8,77816	130,01461	3,96189	27,84241	6,95602	7,50027	38,53340	4,15629
Swimming	Mean	353,0667	17,8000		24,5869	131,1000	23,0667	181,6000	15,5667	17,0333	132,4000	4,1667
	N	30	30		30	30	30	30	30	30	30	30
	Sd.deviation	32,04623	6,17782		7,43211	55,80159	6,21418	22,81046	4,22377	4,34292	20,02343	3,97478
Total	Mean	311,5917	19,7333	19,4975	31,3119	162,4750	24,2333	160,8167	17,2667	18,8083	164,4500	3,4333
	N	120	120	60	120	120	120	120	120	120	120	120
	Sd.deviation	68,50658	6,39687	4,92207	13,02854	152,74111	5,84927	31,03183	5,78426	5,84721	35,92426	3,72756

Discussion and Conclusion

This study aimed to determine the association of the physiological and physical parameters of athletes in different sports with multiple intelligences. A total of 120 athletes participated voluntarily in the study.

The analysis of the collected data showed that the intelligence type of each of the four sports branches was similar to each other. The results of this study are compatible with certain parts of the results of other studies and incompatible with some results.

The intelligence type that the badminton athletes obtained the lowest total score on was found to be Musical Intelligence, which was followed by "visual", "verbal-linguistic", "naturalist", "logical" and "bodily" intelligence types, respectively. The intelligence type that the badminton athletes obtained the highest total score on was found to be intra-personal intelligence.

The physiological and physical parameters that the badminton students obtained the lowest total score on was found to be "Balance", which was followed by the "flexibility", "left hand grip", "right hand grip", "shuttle run 20 m", "sit-ups for 30 seconds", "hanging with bent arm", "long jump", "disc" and "shuttle", respectively.

A study conducted by Yıldız et al. (2003) found that the right hand grip strength of male national badminton athletes was 29.69±3.70 kg, and their left hand grip strength was 25.50±5.91. The leg strength of male national badminton athletes was found to be 72.63±17.67 kg in the same study.

In a study conducted in 2000 by Aydaş (2002) on Turkish National Boxing (n=10, age= 22.7±3.3), Jandarma Gücü Boxing (n=10, age=22.8±1.5) and Bilkent University Boxing (n=10, age= 23.1±2.0) teams, it was found that the right and left hand grip strengths of the Turkish National Boxing Team were 45.3 kg and 41.9 kg, respectively; that the right and left hand grip strengths of Jandarma Gücü athletes were 41.6 kg and 40.2 kg, respectively; and that the right and left hand grip strengths of Bilkent University Boxing team were 44.1 kg and 42.8 kg, respectively.

In a study conducted on a different sports branch, Öcal (2007) found that the dominant hand grip strength of elite wrestlers was 52.17 kg.

Given that the study groups of these studies are elite wrestlers and national badminton players, it can be stated that the grip strength of the badminton players in the present study was very low.

The intelligence type that the swimming athletes obtained the lowest total score on was found to be Musical Intelligence, which was followed by "visual", "naturalist", "intra-personal", "bodily", "social" and "verbal-linguistic" intelligence types. The intelligence type that the swimming athletes obtained the highest total score on was found to be logical intelligence.

The physiological and physical parameters that the swimming students obtained the lowest total score on was found to be "Balance" which was followed by "left hand grip", "right hand grip", "flexibility", "sit-ups for 30 seconds", "shuttle run 20 m", "hanging with bent arm", "long jump", "disc" and "shuttle", respectively.

Muscle endurance, speed and power are important parameters in the sports branches of gymnastics, swimming and athletics. The more muscle endurance increases, the more the number of repeated movement performed by such muscle also increases. The examination of some physical and physiological characteristics (flexibility, strength, growth, speed, endurance, etc.) of girls aged between 8 and 10 years who do gymnastic exercises and some who do not do gymnastics exercises showed that the girls who do gymnastic exercises were speedier (Kesilmiş, 2012). In the present study, it was observed that the speed performance of the athletes was better than that of gymnastic athletes and of swimming athletes. The speed performances of the swimming athletes were found to be the lowest.

The intelligence type that the taekwondo athletes obtained the lowest total score on was found to be Musical Intelligence, which was followed by "naturalist", "visual", "intra-personal", "bodily", "verbal-linguistic" and "social" intelligence types. The intelligence type that the taekwondo athletes obtained the highest total score on was logical intelligence.

The significant differences between bodily/kinesthetic and intra-personal/social intelligence levels were found in a 12-week study of taekwondo athletes by Türkmen (2013).

The physiological and physical parameters that the taekwondo students obtained the lowest total score on was found to be "Balance" which was followed by "left hand grip"," fat percentage", "right hand grip", "flexibility", "sit-ups for 30 seconds", "shuttle run 20 m", "disc", "long jump", "shuttle" and "hanging with bent arm" parameters, respectively.

The intelligence type that the football athletes obtained the lowest total score on was found to be Musical Intelligence, which was followed by "visual", "naturalist", "logical", "verbal-linguistic", "bodily" and "social" intelligence types. The intelligence type that the football athletes obtained the highest total score on was intra-personal intelligence.

The physiological and physical parameters that the football students obtained the lowest total score on was found to be "Balance", which was followed by "left hand grip", "right hand grip", "flexibility", "fat percentage", "sit-ups for 30 seconds", "shuttle run 20 m", "hanging with bent arm", "disc", "long jump" and "shuttle" parameters, respectively.

The movements made in football such as sudden speed up, changing direction, sudden stops, going up for a header, the multiple movements of goalkeepers and striking a ball with the foot are associated with anaerobic energy processes (Polat, 1996). The speed and acceleration in the football skills such as being speedy, changing direction and increasing speed are developed through increasing the strength ability of the contraction in body muscle groups or relevant muscles (Wilsloff et al., 1998).

The number of examinations conducted to analyze the relationship between anthropometric variables and agility is limited. The relationship between the percentage of body fat, muscle mass and agility is not found at a high level as expected. A study conducted on Rugby players found that there was a weak relationship (r = 0.21) between body fat and running to change direction (Sheppard and Young, 2006).

The physiological and physical parameters that the athletes in all of the sports included in the study obtained the lowest total score on was found to be "Balance", which was followed by "left hand grip", "right hand grip", "fat percentage", "flexibility", "sit-ups for 30 seconds", "shuttle run 20 m", "disc", "hanging with bent arm", "long jump" and "shuttle" parameters, respectively.

Kahraman and Bavlı (2014) found that the types of intelligence of students (<100) in the school of physical education and sports were "intra-personal, social and bodily" while the types of intelligence that these students were found to be weak in are "musical, verbal, naturalist and visual".

Similarly, a study conducted by Çinkılıç ve Soyer (2013) on the students in the department of physical education found that the type of intelligence that was strong for these students was "Bodily/Kinesthetic" intelligence, and that the type of intelligence that was weak for them was "Visual" intelligence.

Güllü and Tekin (2009) sorted the intelligence types of students in a sports high school as "bodily, social, intra-personal, verbal, naturalist, logical, visual and musical intelligence", and according to these results, they stated that among the high school students interested in sports, the levels of bodily intelligence developed most, which was followed by the social intelligence levels in second place and by the intra-personal intelligence levels in third place.

İzci and Sucu (2014) compared the subject areas of education received by the students and the scores obtained from these students in the different types of intelligence. They observed that the differences between the mean scores of types of intelligence regarding language, logic and mathematics and body and kinesthetic were significant.

A study conducted by Yalmancı (2011) with students receiving education in different education departments found that there was a significant difference between the types of prospective teachers' intelligence regarding logic and mathematics, having visuality - spatiality, choosing sociability and the subject areas of their education. In this respect, although students receive education according to similar curriculum in the same faculty or high school, the presence of various differences between departments can be accepted as normal.

A study conducted by Sivrikaya & Kaya (2009) with sixth grade students found that an educational method based on the multiple intelligence theory was more effective for teaching volleyball and handball than conventional teaching methods.

As a result, the physiological and physical parameters that the badminton, swimming, taekwondo and football athletes obtained the lowest total score on was found to be "Balance". The distribution of the physiological and physical parameters scores of students in all of the sports included in the study was as follows: "left hand grip", "right hand grip", "fat percentage", "flexibility", "sit-ups for 30 seconds", "shuttle run 20 m", "disc", "hanging with bent arm", "long jump" and "shuttle", respectively. The highest total score for intra-personal intelligence was obtained in badminton and football, while the highest total score for logical intelligence was obtained in swimming and taekwondo. The intelligence type that had the lowest total score in all of the sports was musical intelligence.

Conflict of Interest

The author has not declared any conflicts of interest.

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