An Examination of Hand Preferences, Reaction Times and Some Power Parameters of Athletes in Short Track and Curling Branches

Recep Gursoy[1], Yunus Sadr[2], Murat Ozan[3]

[1]Faculty of Sports Sciences, Mugla Sıtkı Kocman University, Mugla, Turkey
[2]Bayraktar Middle Schools, Erzurum, Turkey
[3]Department of Physical Education and Sports, Ataturk University, Erzurum, Turkey
Email: recepgursoy@mu.edu.tr

Abstract

The aim of this study is to define hand choice, reaction time and measurement of some parameters of male and female national athletes competing in short track and curling branches. With collected findings it is aimed to define the differences between the genders and make a contribution since very limited scientific studies are available about these branches in Turkey. Total of 24 of 10 female national athletes with average age of "16.70" and 14 male national athletes with average age of "16.64". Competing in short track and curling branches were participated to this study. Within the study, Oldfield Edinburg handedness inventory was used for defining athletes' hand choice and simple reaction test of Davis and Frank is used for measuring reaction time. For the consideration of gained data descriptive statistics is used and independent samples t test is used on 0.05 importance level. According to findings collected from the participants, there is a significant difference in genders in terms of height, leg power, right hand and left hand grip power on 0.05 importance level on behalf of male athletes. There is not a significant difference between male athletes' branches and average values of measured parameters according to 0.05 importance level. According to variances between branches, values of leg power of male athletes in curling branch are higher than male athletes in other branches. It is found out that average of height, leg power, right hand and left hand grip power of male athletes are higher than female athletes. However, there is not a significant difference between two groups in terms of average values of reaction time and hand choice variances.

Keywords

Curling, Short Track, Hand Choice, Reaction Time

1. Introduction

Curling, is a sports branch where two teams, each of which is composed of four players, play a game on a rectangular-shaped ice field and the game is full of strategies. Curling game first appeared in Scotland at the beginning of 1500s. Scottish immigrants who settled in Canada at the beginning of the 19th century and they brought Curling game to this country, as well (Karataş et al., 2015).

Short track, is a form of race for players where they reach speeds of up to 60 km/h on ice skates. To maintain their balance, the skaters make a turn by slightly touching the ice with their hands. During this turn, hand preference and reaction time are important for the players (Metu, 2015). In short track, there are 3 individual races in short distance at the Olympic Games: 500 m (4.5 laps); 1000 m (9 rounds); and 1500 m (13.5 laps) (Hettinga et al., 2016).

Hand preference is defined as the individual's preference to use the right or left hand more than the other to fulfill daily life tasks (Tan, 1988). When the individuals work with their right hand, they are guided by their left brain hemisphere and when they work with their left hand, they are guided by their right brain hemisphere. In parallel with this, it was found: right brain hemisphere was more dominant in individuals using their left hand whereas the left brain hemisphere was more dominant in individuals using their right hand. Motor spaces are more dominantly present in the left hemisphere, which controls hands at the rate of 95% approximately. Because of this, most people use their right hand (Leong, 1980). One of the hypotheses based on the right and left hand preferences of people claims that, men in the society use their left hand more than the women (Bourassa, 1996). The rate of reaction is important for the players. The reaction time is the time interval between the voluntary reaction of a living being to the given stimulus and the beginning of the reaction of this stimulus (Dündar, 2012).

In this paper, it is aimed to compare the Turkish young female and male national team players in short track and curling sports branches based on their branches and genders with respect to their hand preference, reaction time and certain bio-motoric characteristics.

2. Method

Those who participate in the research of athletes who were the first as the individual and a team in the Turkish championship. This research was carried out in Erzurum Curling Arena and Short Track halls during the winter camp of the national team. A total of 24 national team players, consisting of 10 women and 14 men participated in the research. Total 24 of 10 female national athletes with average age of "16.70" and 14 male national athletes with average age of "16.64". Competing in short track and curling branches participated to this study.

3. Determination of Hand Preference

Lateralization (The Oldfield Edinburgh Handedness Inventory) questionnaire was applied to determine the hand preferences of the players. There are 10 dif-

ferent questions in the questionnaire to determine which hand is used to handle activities. These items include: striking a match with hand, opening a bottle cap, holding a paddle, holding a fork, holding a knife, holding scissors, throwing a ball or stone, writing, brushing teeth and painting. Players were scored according to their answers where they ticked as "always with left hand", "generally with left hand", "generally with right hand", "always with right hand" or "with both hands" and their hand preference was determined by this method.

4. Reaction Time Measurement

In order to measure the reaction time of the players, Davis and Frank's simple reaction test "reaction time V.3.20" software programmed in computer environment was used in the research. In turns, each player was asked to position his/her right hand first and then the left 1 cm above the key "A". Then, they were asked to respond to the 10 stimuli to come from the computer in indefinite time intervals by pressing the key "A" key. The times of responses given by the players to the stimulus from the computer were automatically recorded on the computer. The averages of measured data were calculated in Microsoft Excel 2013 program. Right hand and left hand reaction time averages were calculated separately for right hand and left hand.

5. Height, Weight and Power Measurement

The weights of the players were measured with the Beurer electronic scale PS08 and their heights with the height measuring instrument. Hand grip power (right and left), back power and leg power measurements were performed with Takkei brand hand, back and leg dynamometers. Measurements were repeated twice and the best rate obtained was recorded in Excel 2013 program in computer environment in kg.

6. Data Analysis

Data collected using questionnaire and measurement methods were recorded in Microsoft Office 2013 Excel program. SPSS 20 (Statistical Package for the Social Sciences) program was used for statistical analysis. Arithmetic mean and standard deviations of these values were obtained using descriptive statistics for the obtained data. The Kolmogorow-Smirnov test, which is the normality test, was applied to determine the difference between the mean values of the variables and the distributions were considered normal since $P > 0.05$ was reached. For this reason, independent sample t-test at 0.05 significance level, was used.

7. Findings

As Table 1 shows there was a significant difference at P: 0.05 between the genders of the players with respect to height, leg power, right hand and left hand grippower. When this difference was examined; the averages of male players' height, leg power, right hand grip and left hand grippowers were higher compared to those of female players.

Table 1. Comparison of certain bio-motoric characteristics with respect to genders.

Athletes	Gender	N	Arit. Mean	Std.Dev.	T	P
Age	Female	10	16.70	1.160	0.134	0.506
	Male	14	16.64	0.929		
Height	Female	10	1.65	0.075	−2.88	**0.009**
	Male	14	1.73	0.067		
Weight	Female	10	53.90	10.51	−1.78	0.089
	Male	14	61.20	9.50		
Leg power	Female	10	64.05	24.95	3.93	**.001**
	Male	14	102.45	22.64		
Back power	Female	10	65.94	22.97	3.87	**0.001**
	Male	14	97.50	17.11		
Right hand grip power	Female	10	26.77	5.24	−3.89	**0.000**
	Male	14	37.94	7.91		
Left hand grip power	Female	10	26.50	7.12	−3.17	**0.004**
	Male	14	36.60	8.07		
Right hand reaction time	Female	10	218.73	22.37	−0.98	0.716
	Male	14	228.33	24.35		
Left hand reaction time	Female	10	234.71	33.16	0.884	0.382
	Male	14	220.48	42.35		

According to Table 2, when the bio-motor characteristics of the participating female players were compared, short track players were found to have a higher value than Curling players at P: 0.05 significance level with respect to flexibility values.

Table 2. Comparison of certain bio-motoric characteristics of female short track and curling players.

Female	Branches	N	Arit. Mean	Std.Dev.	T	P
Age	Short Track	4	16.00	0.816	−1.72	0.101
	Curling	6	17.16	1.17		
Height	Short Track	4	1.70	0.064	1.82	0.107
	Curling	6	1.62	0.068		
Weight	Short Track	4	60.75	8.85	1.92	0.092
	Curling	6	49.33	9.46		
Leg power	Short Track	4	77.88	26.51	1.54	0.163
	Curling	6	54.83	21.06		
Back power	Short Track	4	73.10	27.50	0.788	0.454
	Curling	6	61.16	20.67		
Right hand grip power	Short Track	4	27.27	8.41	0.236	0.058
	Curling	6	26.43	2.59		
Left hand grip power	Short Track	4	30.45	10.01	1.54	0.065
	Curling	6	23.87	3.22		
Right hand reaction time	Short Track	4	225.41	24.37	0.75	0.474
	Curling	6	214.29	22.03		
Left hand reaction time	Short Track	4	236.78	17.18	0.15	0.127
	Curling	6	233.33	42.39		

When the bio-motor characteristics of male players were compared, no significant difference was found between the variables at significance level of *P*: 0.05 (Table 3).

Table 3. Comparison of certain bio-motoric characteristics of male short track and curling players.

Male	Branches	N	Arit. Mean	St. Dev.	T	*P*
Age	Short Track	10	16.50	0.707	−0.904	0.194
	Curling	4	17.00	1.41		
Height	Short Track	10	1.75	0.074	0.766	0.560
	Curling	4	1.72	0.043		
Weight	Short Track	10	62.79	10.82	0.984	0.130
	Curling	4	57.25	3.20		
Leg Power	Short Track	10	108.20	22.57	1.59	0.341
	Curling	4	88.08	17.54		
Back power	Short Track	10	97.15	14.86	0.116	0.465
	Curling	4	98.38	24.61		
Right hand grip power	Short Track	10	37.52	8.19	−0.304	0.751
	Curling	4	39.00	8.24		
Left hand grip power	Short Track	10	36.58	8.86	0.019	0.397
	Curling	4	36.68	6.88		
Right hand reaction time	Short Track	10	227.94	27.26	0.09	0.381
	Curling	4	229.34	18.39		
Left hand reaction time	Short Track	10	225.26	37.25	0.65	0.709
	Curling	4	208.53	57.819		

According to Table 4, when the hand preference and bio-motor characteristics of male players were compared, no difference was found between the variables at significance level of *P*: 0.05.

Table 4. Comparison of hand preference and certain bio-motoric characteristics of male short track and curling players.

Male Athletes	Hand Preference	N	Arit. Mean	Std. Dev.	T	*P*
Height	Right handed	9	1.72	0.0756	−1.314	0.416
	Left handed	5	1.77	0.038		
Weight	Right handed	9	60.33	10.42	−0.447	0.874
	Left handed	5	62.78	8.46		
Leg power	Right handed	9	102.03	26.55	−0.089	0.134
	Left handed	5	103.20	15.97		
Back power	Right handed	9	96.56	20.33	−0.267	0.122
	Left handed	5	99.20	10.93		
Right hand grip power	Right handed	9	39.076	8.054	0.706	0.847
	Left handed	5	35.90	8.09		
Left hand grip power	Right handed	9	36.19	8.463	−0.250	0.967
	Left handed	5	37.36	8.21		
Right hand reaction time	Right handed	9	234.50	20.19	1.304	0.729
	Left handed	5	217.25	29.54		
Left hand reaction time	Right handed	9	232.71	31.86	1.520	0.660
	Left handed	5	198.48	53.47		

As Table 5 suggests, when the hand preference and bio-motor characteristics of female players were compared, no difference was found between the variables at significance level of *P*: 0.05.

Table 5. Comparison of hand preference and certain bio-motoric characteristics of female short track and curling players.

Female Athletes	Hand Preference	N	Arit. Mean	Std. Dev.	T	*P*
Height	Right handed	4	1.60	0.071	−2.17	0.664
	Left handed	6	1.69	0.057		
Weight	Right handed	4	46.50	10.01	−2.15	0.633
	Left handed	6	58.83	8.11		
Leg power	Right handed	4	55.63	12.92	−0.859	0.210
	Left handed	6	69.67	30.42		
Back power	Right handed	4	66.38	12.01	0.046	0.222
	Left handed	6	65.65	29.37		
Right hand grip power	Right handed	4	26.93	3.09	0.072	0.394
	Left handed	6	26.67	6.61		
Left hand grip power	Right handed	4	22.20	2.49	1.720	0.248
	Left handed	6	29.37	7.94		
Right hand reaction time	Right handed	4	209.75	22.80	−1.04	0.832
	Left handed	6	224.73	21.94		
Left hand reaction time	Right handed	4	208.72	21.88	−2.59	0.578
	Left handed	6	252.04	28.14		

8. Discussion

To the best of our knowledge, this study is the first to describe handedness, anthropometric, fitness performance characteristics and reaction time of male and female curling and short track players from Turkey. Curling and short track, known as winter sports, are developing sports branches in Turkey. For this reason, this research intends to contribute to the scientific development of these sport branches by determining the hand preference, reaction time and power levels of players and by finding out whether there is any relation between them. However, since we did not find sufficient amount of relevant scientific studies in the literature, we had to discuss it with some other sports branches. The results of our research show that there were some important structural and functional differences between men/women in curling and short track. Differences between the players with respect to hand preference, reaction time and strength parameters contribute directly or indirectly to success during the matches. (Raymond et al., 1996), (Loffing et al., 2014), (Grouios, 2004) found in their researches that; dominant left-handed players of sports branches such as table tennis and swordplay influenced their opponents depending on their racket and sword handling style, and that the left-handed players were more successful in these sports branches. (Fişekçioğlu, 2011) reported that; left-handed taekwondo play-

ers were more advantageous in exercising. On the other hand (Puterman et al., 2010) found that; right-handed goalkeepers were more successful in recovering goal kicks than left-handed goalkeepers in ice hockey. (Akça et al., 2015) reported that; right-handed players had better they had better shot accuracy rates than left-handed players, depending on hand dominance.

When the literature was examined, there is no significant difference between dominant hand preferences of players in both branches in our study, although there were different results between sports branches with respect to hand preference and success. When the strength values of the research participant players were compared with respect to gender, a significant difference at significance level of 0.05 was found in favor of male players with respect to their leg powers, right hand and left hand grippowers. When the female/male curling and short track players were compared with respect to their bio-motor characteristics, no significant difference was found between the variables at significance level of 0.05. On the other hand, male short track players were found to have average leg strength value of 108.20 while male curling players were found to have an average value of 88.08. However, there was no significant difference at significance level of 0.05.

Discussion is focused on the players in different sport branches, as we have found no previous literature studies on this topic and age group. (Bracko & Fellingham, 2001) found that 12 - 13 years old male ice hockey players had higher average values of body weight. Also 14 - 15 years old males were more powerful than females. (Gursoy et al., 2012) examined the physical and physiological characteristics of Turkish male and female ice hockey players. In their study, male players were heavier, taller and more powerful than females but there was nodifference between the groups with respect to the reaction time. (Göral et al., 2009) studied Muğla University men's tennis team players and men's volleyball team players with respect to their differences in physical fitness characteristics and leg power values were found as 156.8 in tennis players and as 155.77 in volleyball players. (Uğraş et al., 2002) studied Bilkent University's 18 - 24 age football team's physical and physiological characteristics after 10 weeks preparation training and they found leg strength value as 141,39 before the training program. The values in sample researches are higher than our research findings as the average age of the players in our research is low.

In our research, the back power values of male short track players were found as 97.15 and the male curling players were found as 98.38, which showed no significant difference between the branches. (Özer & Kılınç, 2012) compared senior level individual and team players with respect to their strength, speed and flexibility performances and found back power value as 86.20 in individual sports and 77.90 in team sports. The findings of this research are lower than the findings of our research. However, (Harbili et al., 2005) studied the effects of strength training on body composition and certain hormones and they subjected 17 male handball players aged 19.25, with 181.68 cm height and 71.00 weight to strength training for 6 weeks and they found back power values as 101, 42 before

the training program. (Göral et al., 2009) studied Muğla University men's tennis team players and Mugla University men's volleyball team players with respect to the differences in their physical fitness characteristics and they found the back power values as 119.81 for tennis players as 115.70 for volleyball players. These values are higher than our values. This difference could be due to various reasons such as the differences in ages and the types of training.

In this research, right hand grip power value of male short track players was found as 37.52 and left hand grip power as 36.58 whereas right hand grippower value of male curling players was found as 38.99 and left hand claw strength as 36.67 which showed no significant difference between the branches.

(Savaş & Uğraş, 2004) examined the effects of 8-week training of college boys' boxing, taekwondo and karate players on physical and physiological characteristics as a pre-test. In boxers, right hand pre-test grippower was 26.27, left hand pre-test grippower was 23.80; in taekwondo players, right hand and left hand pre-test grippower was 19.27; in karate players, the right hand pre-test grippower was 33.73 and the left hand pre-test grippower was 22.80. Findings in this research were lower than our findings (Ağgön & Ağırbaş, 2015) studied the effect of 12 weeks of table tennis training of 20 male players with an age average of 15.10 on their body composition, anaerobic performance and muscle strength and found the right hand pre-testgrip power valueas 35.55 and the final test as 39.40 whereas the left hand pre-test grip power value as 31.80, and the final test as 36.25. The findings of the research are in parallel with our findings. In our study, the average value of right hand reaction time of male players was found as 227.94 ms, left hand reaction time average as 225.26 ms, right hand reaction time average as 229.34 ms and left hand reaction time average as 208.53 ms. (Arslanoğlu et al., 2010) made a research on 12 senior level male athletes with an age average of 22.16 and found that the average values of the right hand reaction time and the left hand reaction time of the athletes were 212.96 ms and 225.33 ms, respectively. While the left hand reaction time average was low in our research, the right hand reaction time was found to be lower in the research. The reason for this may be that the number of dominant left-handed athletes is low in our research.

In their research, (Duvan et al., 2010) found that, during rest, the average dominant reaction time value was 171.00 for 9 senior level male sword players and it was 231.22 at maximum commitment intensity. (Akyüz et al., 2010) found that, the average the right hand reaction time and the left hand reaction time values of the 56 young national wrestlers with an age average of 19.09 were, 195.80 and 194.70, respectively. Comparison of these researches with our research showed that their reaction time averages had better and higher values compared to our findings. There was no significant difference in age, height, weight, leg strength, back strength, right and left hand claw force, right and left hand visual reaction time average values when comparing the branches of the female players participating in the study.

In our research, the leg power values of female short track players were found

as 77.88 and the female curling players as 54.83. It was observed that, while there was no significant difference between the leg power values of female short track players, they were found to be higher than the average values of female curling players.

(Ali, 2011) conducted a thesis study on a female group of 30 studying Ankara Gazi University, Physical Education and Sports School. The group consisted of 15 control members and 15 test members who had never played badminton before. They were exposed to a training program of 8 weeks. The leg power value of the test group was found as 49.83 and the control group as 48.26. The values of this research are lower than our findings. This different seems to be arising from the fact that, the female players in our research were active athletes. (Savaş & Uğraş, 2008) conducted a pre-test research on 21 female national wrestlers with an age average of 18, before a 6-week training program. They found the pre-testback power value average as 126.54 and the final test average as 129.52. The data of the research conflict with our findings. In this research, the average back power value of female short track players was found as 73.10, and the average back power value of female curling players was found as 61.16. There was no significant difference between female short track and curling players with respect to average back power values. (Çınar et al., 2009) conducted a research where they compared the physical parameters of 44 senior level female boxers and 36 female handball players and they found that average back strength value of female handball players was 88.28 and average back strength value of female boxers was 94.43. (Göral & Göral, 2015) conducted a research on 18 female soccer players with an age average of 20.44 and training age average of 5.67 and they found that, the average back power value of female soccer players was 90.74.In this study, the average right hand grippower value of female short track players was found as 27.27 whereas average left hand grippower value was found as 30.45; the average right hand grippower value of female curling players was found as 26.43 whereas average left hand grippower value was found as 23.87. There was no significant difference between short track and curling female athletes with respect to average values of right and left hand grippower. (Savucu et al., 2006) conducted a research where they compared the physical parameters of Fenerbahçe women's basketball team (N = 12) and Üsküdar Anatolian women's handball team (N = 12) and they found that average right hand grip power of the women's basketball team was 32.83 whereas average left hand grip power was 31.58; the handball team's average right hand grip power was found 35.85 whereas average left hand grip power was 33.80. (Çınar et al., 2009) conducted a research where they compared the physical parameters of 44 senior level female boxers and 36 female handball players, and they found that, average right hand grip power value of female boxers was 34.29 and average left hand grip power value was 33.35 whereas average right hand grip power value of female handball players was 36.79 and average left had grip power value was 34.70. The values of both the back strength and the girp power of the female athletes in the case studies are higher than our findings. This difference may be due to the fact that the

average age of short track and curling players in our study group is smaller. In the same research, the average right hand reaction time value of female boxers was 192.47 and the average left hand reaction time value was 193.33 whereas the average right hand reaction time value of female handball players was 205.17 and average left hand reaction time value was 208.34. In our research, the average right hand reaction time value of short track female players were found as 225.41 and average left hand reaction time value was found as 236,78 whereas the average right hand reaction time value of female curling players was found as 214.29 and average left hand reaction time value as 233.33. The average of the values we obtained is lower than the average values of the above studies in the negative direction. (Yüksek & Cicioğlu, 2004) conducted a research where they compared certain physical and physiological parameters of Turkish and Russian Judo Under 21 National Women's Teams, and they found that, the average right hand reaction time value of 22 Turkish female judo players was 237.59 and average left hand reaction time value was 243.68 whereas the average right hand reaction time value 14 Russian female judo players was 214.42 and average left hand reaction time value was 231.92. The data of this work are in parallel with our findings. When the players participating in the research were compared according to their hand preference, no significant difference at the significance level of 0.05 was found between the average values obtained from the variables.

In the discussion part of our study, we had to compare our findings with the findings of different sports branches due to lack of scientific data on curling and short track sport branches regarding the hand preference, reaction time and some force parameters. This may be the limitation of our work. Therefore, it can be said that more detailed scientific studies are warranted about the subject.

9. Conclusion

The statistical analysis of the data obtained from this research showed that male curling and short track players had higher height, leg power, right hand grip and left hand grip power than female players. Although the difference between the average values of female and male players may be considered to be arising from the physical and physiological superiority of men over women, it is important to determine the difference between the average values of male and female short track and curling players. On the other hand, there were no significant differences between the branches with respect to reaction time and hand preferences. Determining the physical and physiological characteristics of the players involved in the newly developing short track and curling sport in Turkey, it is important for the performance of the players and for the player group to be selected. The data obtained showed that, certain parameters of the players were negatively lower than the findings of other player groups in the literature and detection of such was a helpful step. It was reported that, further scientific researches were required to achieve success. It is also thought that, the findings of this research will contribute to such scientific researches to be conducted on short track and curling sport branches in the future.

References

Ağgön, E., & Ağırbaş, Ö. (2015). Effect of 12-Week Table Tennis Training on Body Composition, Anaerobic Performance and Muscle. *Inönü University, Physical Education and Sports Science Magazine, 2,* 12-20.

Akça, F., Çekin, R., & Ziyagil, M. A. (2015). The Impact of Hand Dominance on Targeted High Firing Performance in Young Men. *Celal Bayar University Journal of Physical Education and Sport Sciences, 2,* 1-8.

Akyüz, M., Koç, H., Uzun, A., Özkan, A., & Taş, M. (2010). Examination of Some Physical Fitness and Somatotype Characteristics of Young Athletes in Turkish Wrestling National Team. *Ataturk University Journal of Sports Sciences, 12,* 41-47.

Ali, K. G. (2011). *The Effect of 8 Week Basic Badminton Training on Some Physical and Physiological Parameters Applied to Female Students.* Graduate Thesis, Ankara: Institute of Health Sciences, Department of Physical Education and Sport, Gazi University.

Arslanoğlu, E., Arslanoğlu, C., Aydoğmuş, M., & Şenel, Ö. (2010). Reaction Time and Balance Relation to Badminton Sports. *Nigde University Journal of Physical Education and Sport Sciences, 4,* 131-136.

Bourassa, D. C. (1996). Handedness and Eye-Dominance: A Metaanalysis of Their Relationship. *Laterality: Asymmetries of Body, Brain and Cognition, 1,* 5-34.
https://doi.org/10.1080/713754206

Bracko, M. R., & Fellingham, G. W. (2001). Comparison of Physical Performance Characteristics of Female and Male Ice Hockey Players. *Pediatric Exercise Science, 13,* 26-34. https://doi.org/10.1123/pes.13.1.26

Çınar, V., Polat, Y., Savucu, Y., & Şahin, M. (2009). Examination of Some Physical Parameters of Elite Female Boxers and Handball Players. *E-Journal of New World Sciences Academy, 4,* 162-170.

Duvan, A., Toros, T., & Şenel, Ö. (2010). The Effect of Maximal Load Intensity on Visual Reaction Times of Elite Turkish Fencers. *Niğde University, Journal of Physical Education and Sport Sciences, 4,* 149-150.

Dündar, U. (2012). *Training Theory* (8th ed., pp. 8-10). Ankara: Nobel Publishing House.

Fişekçioğlu, I. B. (2011). Relation of Hand Preference, Muscle Power, Lung Function and Reaction Time in right-Handed Taekwondo Players. *World Applied Sciences Journal, 12,* 1288-1290.

Göral, K., & Göral, Ş. (2015). Examination of the Relationship between Sprint Speed, Vertical Jump and Force Parameters in Female Soccer Players. *Manas Social Research Magazine, 4,* 117-123.

Göral, K., Saygın, Ö., Karacabey, K., & Gelen, E. (2009). Comparison of Some Physical Fitness Features of Tennis Players and Volleyball Players. *E-Journal of New World Sciences Academy, 4,* 231-233.

Grouios, G. (2004). Motoric Dominance and Sporting Excellence: Training versus Heredity. *Perceptual and Motor Skills, 98,* 53-66. https://doi.org/10.2466/pms.98.1.53-66

Gursoy, R., Aggon, E., Stephens, R., & Ziyagil, M. A. (2012). Comparison of the Physical and Biomotor Characteristics, and Reaction Time between Turkish Male and Female Ice Hockey Players. *Advances in Physical Education, 2,* 169-171.
https://doi.org/10.4236/ape.2012.24029

Harbili, S., Özergin, U., Harbili, E., & Akkuş, H. (2005). Effect of Strength Training on Body Composition and Some Hormones. *Hacettepe Journal of Sport Sciences, 16,* 64-76.

Karataş, A., Erdal, R., Başaran, Z., Seyrek, E., Gül, M., & Eskiyecek, C. B. (2015). 2012

Yılında Düzenlenen Erzurum Avrupa Curling C Klasmanı Ile Karlstad Avrupa Curling B Klasmanı Organizasyon Yapısının Incelenmesi. *International Journal of Science Culture and Sport, 3,* 167-177. https://doi.org/10.14486/IJSCS372

Leong, C. K. (1980). Laterality and Reading Proficiency in Children. *Reading Research Quarterly, 15,* 185-202. https://doi.org/10.2307/747324

Loffing, F., Sölter, F., & Hagemann, N. (2014). Left Preference for Sport Tasks Does Not Necessarily Indicate Left-Handedness: Sport-Specific Lateral Preferences, Relationship with Handedness and Implications for Laterality Research in Behavioural Sciences. *PLoS ONE, 98,* e105800. https://doi.org/10.1371/journal.pone.0105800

Özer, Ö., & Kılınç, F. (2012). Comparison of Strength, Speed and Flexibility Performances of Elite and Team Athletes. *International Journal of Human Sciences, 9,* 1-9.

Puterman, J., Baker, J., & Schorer, J. (2010). Laterality Differences in Elite Ice Hockey: An Investigation of Shooting and Catching Orientations. *Journal of Sports Sciences, 28,* 1581-1593. https://doi.org/10.1080/02640414.2010.514281

Raymond, M., Pontier, D., Dufour, A. B., & Moller, A. P. (1996). Frequency-Dependent Maintenance of Left Handedness in Humans. *Proceedings of the Royal Society of London B: Biological Sciences, 263,* 1627-1633. https://doi.org/10.1098/rspb.1996.0238

Savaş, S., & Uğraş, A. (2004). The Effects of the Eight Week Pre-Season Training Program on the Physical and Physiological Characteristics of University Men's Boxing, Taekwondo and Karate Athletes, Gazi University. *Gazi Education Faculty Journal, 24,* 257-274.

Savaş, S., & Uğraş, A. (2008). Examination of Selected Physical and Physiological Characteristics of Turkish Women National Boxing Team. *Journal of Atatürk University Sports Sciences, 10,* 61-72.

Savucu, Y., Erdemir, I., Akan, I., & Canikli, A. (2006). Comparison of Physical Fitness Parameters of Elite Female Basketball and Handball Players. *Spormeter Physical Education and Sports Science Magazine, 3,* 111-116.

Tan, Ü. (1988). The Distribution of Hand Preference in Normal Men and Women. *International Journal of Neuroscience, 41,* 35-55. https://doi.org/10.3109/00207458808985740

Uğraş, A., Özkan, H., & Savaş, S. (2002). Physical and Physiological Characteristics of the Bilkent University Football Team after 10 Weeks of Preliminary Preparation. *Gazi University, Gazi Education Faculty Magazine, 22,* 241-252.

Yüksek, S., & Cicioğlu, I. (2004). Comparison of Some Physical and Physiological Parameters of Turkish and Russian Judo Hopeful Female Teams. *Spormeter Physical Education and Sports Science Magazine, 4,* 139-146.