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ORIGINAL ARTICLE

The Relationship Between Core Stabilization and Balance in The Curling Athletes

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ABSTRACT

Objective: The aim of this study is to the relationship between core stabilization and balance in the national curling athletes.

Materials and Methods: 38 curling player, 19 men and 19 women, whose average of age was 19.67±2.90 were included in the study. İn the study, Body composition were measured to use TANİTA TBF 300 device. To Measure Core stabilization levels were used Sit-Up Test, Biering Sorenson Test and Sport-Specific Core Muscle Strength & Stability Plank Test. Balance were measured with SPORKAT 4000 Dynamic and Static Balance Device.The analysis of acquired datas from study is doneusing SPSS (version 24) for Windows Statistical Programme.Independent t-test was used for the comparison of paired groups while Pearson correlation was used for the control of the association between variables. Significance for statistical datas was selected being $p<0.05$.

Results: Sit-up Test average were 44.31± 7.59 in men and 30.84±6.13- in women, Biering Sorenson Test average were 226.78±74.60 in men and 289.10±111.10 women, Sport-Spesific Core muscle strength & stability plan test average 280.26±113.14 in men and 176.05±47.128 women. Dynamic Balance Test average were 7677.26±1467.12 in men and 5207.94±1436.02 in women. The Static balance average were definitely 7759±1554.98 in men and 5477.63±2004.06 in women.

Conclusion: As a result of the study, it is found that there wasn't a significant relation between back endurance and static, dynamic balance, that there was a significant relation between sit up and static, dynamic balance. There was significantly relation between plank time and dynamic balance. However between Plank time and Static balance was not significantly relation.

Keywords: Balance; Body composition; Core; Curling

INTRODUCTION

Athletes' aim is to maintain and improve their physical fitness and to continue their sportive success (1). Scientific researches about the exercises selected within the training plans inform the conditioners and athletes about which types of exercises will be applied and in what form (2). A physical load is necessary to ensure physical, mental and psychological development in every athlete or normal individual (3). Because the physically active individual also feels good psychologically and mentally. All sports branches contain certain physical, psychological and mental prerequisites. These prerequisites can be at various rates for each branch (4). Every athlete must properly develop all three of these prerequisites for top performance. The most important of these is to maximize the physical parameters. Because the level of biomotor skills directly affects the level and condition of the other two features.

Curling is a team sport that includes physical challenges and high tactical skills (5). Because of playing on ice, athletes need to develop their biomotor skills more. Curling athletes basically have to develop their balance, strength and endurance characteristics well (6).

Balance is a structure that combines sensory perceptions with the effective use of systems that help maintain the postural position. Balance is the ability to maintain postural posture and is developed with physical loads (7). It is important to maintain the postural position in curling. With the preservation of the postural posture, problems will not occur during the application of the techniques belonging to the branch, and the rhythm, speed and angle of the shot will be performed as desired (8). It is essential that the sweeping process is balanced, as in shooting, and that it is applied by maintaining this stability until the movement is finished. With the preservation of balance, the amount of energy consumed will decrease, and the capacity to do more work with less energy will increase. Accordingly, athletes will have the chance to exhibit their performances at high levels for a longer period of time.

The core is the powerhouse of the body. The core acts as a link between the lower and upper extremities in performing many manipulative and some locomotor movements (9). It plays an active role in the application of many movements from core basic movements to sports movements and affects performance. Therefore, core strength and stabilization are very important for many sports branches and for sedentary individuals to perform their daily living activities (10). Core is of great importance for maintaining balance (11). For many sports branches, the core is very important for the development of performance.

İt is seen that there is no study that reveals the relationship between core and balance in the curling. In this context, the study purpose is to examine the relationship between the core stabilization levels of curling athletes and their balance performance.

MATERIAL AND METHOD

Participants: Nineteen female and nineteen male athletes, who took part in any level of curling national teams at least once and played curling actively for at least 2 years, with an average age of 19.65±2.90 years, participated in the study. The G*Power 3.1.3 program was used to determine

the sample size and it was determined that 38 people would be sufficient to participate in the study. While the subjects were included in the study, no training program was applied to the subjects, who were active in sports, were healthy, and had not been exposed to sports injuries in the six-month period before the study, except for the training they performed regularly. Ethical approval was obtained from the Ondokuz Mayıs University Medical Research Ethics Committee to conduct the study. This study was produced from a master's thesis.

Study Procedure Warming: Subjects were given a fifteen-minute warm-up period before testing. During this period, the subject performed five minutes of aerobic running and ten minutes of active stretching after the run.

Body Composition Measurements: The body composition of the subjects was determined with the TANITA TBF-300-A device. During the measurements, the subjects were brought to the analyzer with bare feet, wearing only shorts and sports vests. Subjects were asked not to eat or drink anything at least three hours before the measurements.

Balance Measurements: SPORTKAT 4000 Balance Measurement device was used for static and dynamic balance measurements. Before the measurements, information about the balance device and the test was transferred orally. After the verbal information, the structure of the test and how it was done were shown with a person who had previously been measured on the balance device. Afterwards, the subjects were allowed to try a static and a dynamic balance test in order to get to know the device and be more efficient in the test. Static and dynamic balance measurements took thirty seconds each. The subjects performed the measurement by following the measurement rules throughout the measurement.

Back Isometric Endurance Measurement: The back isometric endurance test was used as an important static test to evaluate the endurance of the back extensors. For this test, the athlete was placed in the prone position with his/her body hanging from the bed from the waist area. The subject was fixed on the bed over the gastrocnemius muscle and was asked to keep his/her body parallel to the ground against gravity with his/her hands clasped on the chest. Partial (five to ten degrees) trunk extension is allowed. When the subject was ready, the test was started and when the posture was disturbed, when the athlete stopped the test due to fatigue and pain, the time was stopped and the degrees were recorded in seconds.

Sport-Specific Stability and Plank Measurement: It is a test developed to measure core strength and stabilization. The test consists of a total of eight stages. The subject continued to move on to the next stage after the duration of each stage was completed. After the eight stages were completed, the test was continued in the same order by returning to the first stage. During the test, care was taken to preserve the position of the hip and waist. Stages of the test;

- In the first stage of the test, the subject takes the plank position and maintains the position for 60 seconds with the start command. At the end of 60 seconds, the second stage is passed.
- In the second and third stages, the subject cuts the contact of his/her right and left arms with the ground respectively, extends them forward to be parallel to the ground and maintains his/her position for 15 seconds. At the end of 15 seconds, the subject returns to the starting position.
- In the fourth and fifth stages, they keep their positions for fifteen seconds by cutting off the contact of the first right and then the left foot with the ground, as in the arms. When the 15-second period is complete, the subject returns to the starting position.
- In the sixth stage, he/she breaks the contact of his/her right arm and left foot with the ground and waits for 15 seconds. When the time is up, it returns to the starting position.
- In the seventh stage, he/she cuts off the contact of his/her left hand and right leg with the ground, maintains his/her position for 15 seconds and returns to the starting position when the time is up.
- In the eighth stage, he/she maintains the plank position for thirty seconds and completes the eighth stage.

Sixty Second Sit-up Measurement: The subjects' abdominal endurance was measured with the YMCA (Young Men's Christian Association) one-minute sit-up test. Subjects lie on their backs on a flat surface with their knees bent at approximately 90 degrees, hands clasped behind the head. With the start command, the subject touches the left knee with his/her right elbow and returns to the starting position, then touches the right knee with his/her left elbow. Each touch was counted as one point, and correct repetitions in one minute were recorded as the maximum number of sit-ups.

Statistical analysis: Statistics of the study were made using IBM SPSS Statistics ver. 25.0 (IBM Co., Armonk, NY, USA). Visual and analytical methods were used to define whether the obtained data were normally distributed. All data were analyzed by independent t-test to determine gender differences. Pearson correlation test was performed to determine the relationship between static and dynamic balance and core tests.

RESULTS

Table 1. Descriptive Characteristics of Subjects

	N	Min.	Max.	X	S.d.
Age (years)	38	18,00	28,00	19,65	2,90
Height (cm)	38	152,00	190,00	168,89	9,12
Weight (kg)	38	40,70	81,90	60,48	8,94
Body Mass Index (kg/m2)	38	17,20	28,50	21,12	2,21
Body Fat (%)	38	2,40	30,40	13,5526	8,24

Table 2. Comparison of core strength and stabilization tests and balance tests in terms of gender

	Gender	N	X	S.d.	p
Sixty Second Sit-up	Male	19	44,31	7,59	,000*
	Female	19	30,84	6,13	
Back Isometric Endurance	Male	19	226,78	74,60	,050
	Female	19	289,10	111,10	
Stability and Plank	Male	19	280,26	113,14	,001*
	Female	19	176,05	47,12	
Static Balance	Male	19	7759,00	1554,98	,000*
	Female	19	5477,63	2004,06	
Dynamic Balance	Male	19	7677,26	1467,12	,000*
	Female	19	5207,94	1436,02	

Table 3. The Relationship between core stabilization/strength and Balance

		Static Balance	Dynamic Balance
Back Isometric Endurance	r	-,106	-,262
	p	,526	,113
Sixty Second Sit-up	r	-,401	-,479
	p	,013*	,002*
Stability and Plank	r	,149	-,407
	p	,373	,011*

DISCUSSION

According to the results obtained from our research; It was determined that there is a significant relationship between static and dynamic balance and core stabilization. It can be said that the anterior part of the body is more related to static and dynamic balance than the posterior part. In stability and plank test and sit-up test, male subjects were better than female subjects; otherwise, Back isometric endurance test, female subjects were better. It was determined that there was difference between the two groups in terms of static and dynamic balance levels in favor of female subjects.

Core stabilization and balance are two features that directly affect the application of skills and affect performance outcomes. In this sense, revealing the relationship between core and balance is important for athletes. There are many studies in the literature on core and balance related to different subject groups (athletes, the elderly, patients and sedentary). It reported that core stabilization exercises have a significant effect on dynamic balance in a study on ballet dancers and dancers (12). Similarly, it determined that there is a relationship between dynamic balance and core region in their studies on archers (13). In their study with badminton athletes, it reported that core stabilization training affects balance performance (14). Other a research stated in their study with nineteen young football players that trunk stabilization exercises had positive effects on static and dynamic balance (15). Also, it stated that there is a significant relationship between core stabilization and dynamic balance in their studies with football players (16). There is a positive relationship between core stabilization and dynamic balance in their study with thirteen young athletes (17). In another study, the dynamic balance values of the runners who performed core stabilization exercises were better (18). A research for university students, there is a relationship between the development of core stabilization and static balance (19); In a study conducted by Sekendiz on middle-aged sedentary women, it was stated that there is a relationship between core development and dynamic balance (20). In study with 90-year-old sedentary elderly individuals, found a relationship between core stabilization and strength and dynamic balance (21); It evaluated the relationship between core stabilization and balance of former dancers and sedentary elderly individuals aged 50-87 years and stated that there was a positive relationship (22). Core exercises applied to Parkinson's patients have positive effects on dynamic balance (23). Study with subjects with down syndrome, revealed that core stabilization training has positive effects on balance performance (24).

Core exercises performed in different age groups and subject groups improve dynamic and static balance. In athletes, sedentary, elderly and disabled groups; strengthening and increasing endurance of local and global muscles, improvement of power transmission and sense of motion, improvement of flexibility level of lumbo-pelvic and abdominal region, stabilization of spinal region, reduction of muscle imbalances may be the reason for the relationship with balance development. The fact that men have higher core stabilization than female athletes may be mainly due to their body composition, muscle and body fat ratios, and distribution of sex hormones. The reason why there is no difference in static balance between male and female subjects can be attributed to factors such as coordination, attention, movement perception and vestibular harmony, being included in the same training programs, and having a certain training history.

CONCLUSION AND RECOMMENDATIONS

It was concluded that there is a significant relationship between the core stabilization of the subjects and their static and dynamic balance performances. While men have higher values than women in the number of sit-ups and plank score, it has been concluded that women have higher results in isometric back endurance. Women get higher scores than men in static and dynamic balance skills, and as the static balance score increases, the dynamic balance score increases. Since core training does not require an auxiliary weight structurally, it can be used for health, performance and rehabilitation purposes in every age group.

Studies can be conducted to determine the training programs for curling athletes to develop balance and core strength. Studies can be conducted to examine the relationship between core stability and balance with curling athletes in older and different age groups.

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