ORIGINAL ARTICLE

The Relationship of Elite Curling Athletes' Static and Dynamic Balance Levels and Shooting Performances

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ABSTRACT

Objective: To examine the relationship between static and dynamic balance and the shooting performance of curling athletes who continue their sports life actively at the elite level.

Materials and Methods: A total of 15 athletes in the curling A national women's and men's teams participated in the research. The body compositions of the subjects were measured using the BODPOD device. SPORKAT 300 device was used to determine the static and dynamic balance levels. Static and Dynamic balance measurements were performed on both feet, right feet and left feet. In order to evaluate the shooting performance of the subjects, the curling shooting performance evaluation scale developed by Bedir and Erhan was used. SPSS v25 was used in the analysis of the data obtained from the measurements. The significance level was accepted as 0.05 in all statistical evaluations.

Results: When the data obtained from the subjects were examined, it was determined that there was a significant relationship between both static and dynamic balance and shooting performance. In addition, it was determined that there were significant relationships between the subjects' body compositions, static/dynamic balance levels and shooting performances.

Conclusion: It was determined that there is a significant relationship between static and dynamic balance and shooting performance. Significant relationships were determined between body composition and static and dynamic balance.

Keywords: Curling, Shooting Performance, Balance, Body Composition

INTRODUCTION

Curling is an ice sport based on talent and tradition (Bradley, 2009). Curling teams consist of four aces and a substitute, plus 5 people (Maeno, 2016). Teams fight each other by throwing stones at the area called home on the ice (Turriff, 2016). Curling is a sport that requires advanced strategy and high physical performance in elite level competitions. In Olympic and world level competitions, teams may need to play 12-15 matches to be on the medal podium (Bradley, 2009). Each match can last an average of 90-120 minutes and a maximum of 143 minutes. This indicates high physical performance for performance in elite curling competitions. The main goal of curling athletes is to move the stones of the opposing team away from the house with the stones they throw and to position their own stones close to the center of the house (World Curling, 2021).

Balance is a complex structure consisting of the combination of visual, auditory and sensory perceptions with the most effective use of many systems related to maintaining body position (Hrysomallis, 2011; Mickle et al., 2011). Balance is divided into static and dynamic. Balance is an important feature that determines the quality of the skill along with the coordination feature during the implementation of skills (Giboin et al., 2015). Postural balance is an important parameter for the desired direction, intensity and quality of movements (Chou et al., 2009). In this sense, athletes need to improve their balance features in addition to their motoric features.

Since curling is played on ice and is a sport based on hitting and positioning, the balance feature must be well developed in order to realize the determined strategy and to use the physical properties fully and properly. In this context, the main purpose of the research is to examine the relationship between the static and dynamic balance levels of elite curling athletes and their shooting performance.

MATERIAL AND METHOD

Study Universe and Sample: The universe of the study consisted of curling athletes living in Erzurum. The sample group consisted of 7 female and 5 male athletes who took part in the Curling A national teams with an average age of 23.75±3.22 years. While the subjects were included in the study; attention was paid to the fact that they continue their sports lives actively, that they are healthy and that they have not been exposed to a serious sports injury in the 6-month period before the study. No training program was applied to the subjects except for pieces of training they performed regularly. Approval for this research was obtained from the Sub-Ethics Committee of Atatürk University, Faculty of Sports Sciences. This study was supported by Atatürk University Scientific Research Office (Project No: TAB-2021-9456).

Working Procedure Warming: Subjects were given a 15-minute warm-up period before performing the balance tests. During this period, the subject performed 5 minutes of aerobic jogging followed by 10 minutes of active stretching. Before the shooting performance measurements, it was ensured that the warm-up procedures carried out in the pre-competition preparation were followed.

Height Measurement: Height measurements were made with the help of a wall-mounted stadiometer. The subjects were asked to be in an upright position, look ahead and not move during height measurements. Height measurements of the subjects were made on bare feet and on a flat surface.

Body Composition Measurements: The body

composition of the subjects participating in the study was determined with the BODPOD device. BODPOD is a device that can measure body fat percentage and basal metabolic rate by air displacement plethysmography method. Before the measurements, it was waited for 30 minutes for the device to warm up. After warming up, Analyze Hardware, Autorun, Test System, Scale and Volume calibrations were performed (Tucker et al., 2014). The subjects stopped eating and drinking at least 3 hours before coming to the laboratory for measurements and were taken to the measurements. It was ensured that the subjects were taken to the measurements by using sports vests and short shorts leggings (Fields et al., 2000). While the subjects were taken into the capsule, care was taken to ensure that they were not wearing glasses, earrings or necklaces. The subjects were warned to breathe normally, not to move, and to remain calm during the measurement.

Balance Level Measurements: Static and dynamic balance measurements were made with the SPORTKAT 4000 balance measuring device. Before the measurements, the information about the balance device and the test was verbally explained to the subjects. 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. Subjects were allowed to try one static and one dynamic balance test in order to get to know the device and be more efficient in the test. After the trials were completed and the warm-up was carried out, static and dynamic balance tests were carried out. In static tests, the subjects tried to keep the X sign, which represents themselves, fixed in the middle of the circle. In dynamic tests, it was ensured that they follow another sign moving in a clockwise direction with a constant speed. The rotation speed was determined as 3 (medium speed) in dynamic tests. Both tests took 30 seconds. It was ensured that the subjects did not come into contact with the environment during the measurement.

    Curling Shooting Performance Evaluation

    The shooting performances of the subjects participating in the research were carried out with the Curling Shooting Performance Scale developed by Bedir

and Erhan (2020). 10 milling shots were made to the subjects without disturbing the shooting standards and scoring was carried out in accordance with the scale.
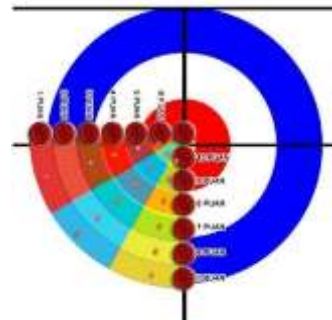

Figure 1. Curling shot performance scoring scale

Statistical Analysis: SPSS 24 for Windows Program was used in the statistical analysis of the data obtained from the study. Data; The maximum/minimum value is presented as the arithmetic mean and standard deviation. Independent t-test was used to compare paired groups. Pearson correlation test was used to control the relationship between variables. The normality of the distributions and the homogeneity of the variances were determined by the Mauchly' Sphericity Test and Levene's test. Statistical significance level (p) was determined as 0.05.

RESULTS

Table 1. Descriptive Characteristics of Subjects

	N	Min.	Max.	X	Sd.
Age (year)	12	20,00	32,00	23,75	3,22
Height (cm)	12	157,00	194,00	171,16	9,27
Body Weight (kg)	12	53,00	78,00	64,25	8,92
Body Fat Percentage (%)	12	15,50	22,25	18,05	3,22
Body Mass Index	12	16,47	21,91	18,70	1,79

Table 2. Static/Dynamic Balance and Shooting Performance Comparisons by Gender

	Gender	N	X	S.s	t	p
Static Balance Score	Male	7	401,95	102,31	-1,538	,155
	Female	5	495,80	109,09		
Dynamic Balance Score	Male	7	977,57	223,81	-2,563	,028*
	Female	5	1266,40	166,42		
Shooting Performance Score	Male	7	41,42	13,53	-3,349	,007*
	Female	5	63,80	9,60		

Table 3. The Relationship Between Shooting Performance and Static/Dynamic Balance

		Static Balance	Dynamic Balance
Shooting Performance Score	r	,100	,190
	p	,757	,553

DISCUSSION

In this study, the relationship between the static and dynamic balance performances of curling athletes and their shooting performance was investigated. As a result of the analyzes, it was determined that there were significant

differences in favor of men in dynamic balance performance and in favor of women in shooting performance according to gender, but it was determined that there was no significant difference between male and female subjects in static balance performance. In dynamic balance performance, the results of this study are similar to the results of previous studies. There are many studies evaluating balance performance according to gender in different subject groups. Andreeva et al., (2020) determined that women perform better than men in dynamic balance performance. In another study; Gribble et al., (2009) reported that female subjects had better

dynamic balance performance than males in their study evaluating postural stability in athletes. Whyte et al., 2015 reported that women who exercise regularly have better dynamic balance than men. In another study, Christian Raschner et al. (2017) evaluated the balance performance of alpine skiers in different age groups according to gender and age, and found that there were significant differences in different balance aspects in different age groups. Again, SEKULIC et al. (2013) stated in their study that female subjects had higher mean values than males in different dynamic balance evaluations. Contrary to the findings of this study, Howell et al. (2017) stated that the dynamic balance and postural control performances of male and female athletes were similar.

When the relationship between shooting performance, which is the main purpose of the research, and static and dynamic balance performances was evaluated, it was determined that there was no significant relationship. Sattlecker et al., (2014) determined that there is no significant relationship between balance and shooting performance in their study on biathlon athletes. Mulazimoğlu et al., (2016) determined in their study on archers that there is no significant relationship between shooting performance and balance. Mojžiš and Paugschová (2013) stated that the relationship between balance and shooting performance is based on individual differences. On the other hand, Aydın and Revan (2019) stated that dynamic balance has a positive effect on shooting performance in their study on air pistol athletes. Park et al., (2019) also determined that there is a significant relationship between the dynamic balance performances of air pistol athletes and their shooting performance in their study.

RESULTS

As a result, it was determined that there was no significant relationship between dynamic balance and shooting performance in curling athletes. In addition, it was determined that female curling athletes had better dynamic balance performance and throwing performance than male athletes.

Suggestions: In future studies, the relationship between dynamic and static balance and shooting performance can be investigated by using sport-specific tests with larger sample groups. New studies can be designed with curling athletes of different ages and athletic performance levels.

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