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Investigation of balance performance of wrestling and kickboxing athletes

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Abstract

Background and Study Aim: Balance performance is one of the significant requirements to achieve success in wrestling and kickboxing. Although the evaluation of balance performance is important in both sports branches, there are a limited number of studies on this subject. Additionally, there is no study comparing the two branches in terms of balance performance. Therefore, the purpose of this study was to investigate the balance performances of wrestling and kickboxing athletes.

Material and Methods: Thirteen Greco-Roman wrestlers (age: 20.69 ± 1.32 years, height: 176.0 ± 4.30 cm, body mass: 75.54 ± 6.81 kg) and thirteen kickboxers (age: 20.23 ± 2.49 years, height: 177. 62 ± 5.03 cm, body mass: 77.08 ± 8.44 kg) who participated in national competitions were included in the study voluntarily. The Biodex Balance System (BBS, Biodex Medical Systems Inc., Shirley, NY) was used to test dynamic balance and three index scores were recorded: overall stability index (OSI), anterior-posterior stability index (APSI) and medio-lateral stability index (MLSI). Dynamic balance measurements of the participants were conducted with eyes open condition. An independent sample t-test was used to compare the outputs of the dynamic balance tests of wrestlers and kickboxers. All statistical analyses were conducted using the SPSS software package, version 24.0 (SPSS Inc., Chicago, IL, USA).

Results: The comparison of dynamic balance between kickboxers and wrestlers revealed no significant differences in the OSI, APSI, and MLSI parameters ($p > 0.05$). These findings suggest that despite the inherent differences in technical requirements and training protocols between kickboxing and wrestling, both groups of athletes demonstrate similar levels of proficiency in maintaining dynamic balance. Such parity challenges potential assumptions regarding disparities in balance performance across these disciplines.

Conclusions: The balance performances of wrestling and kickboxing athletes are similar, as evidenced by the lack of significant differences in dynamic balance parameters between the two groups. This suggests that balance performance may be influenced by the specific features of each sport and the training levels of the athletes, rather than inherent differences between the sports themselves.

Keywords: balance, kickboxing, wrestling, dynamic.

Introduction

Balance can be defined as the ability to control the position of the body in space for orientation purposes. It can also be referred to as postural control. Postural control or balance is a complex skill that can be defined statically as the ability to maintain a base of support with minimal movement and dynamically as the ability to maintain the position of the organism while performing a task in a stable position [1]. Balance is an important component of performance achieved through a complex process involving the function of musculoskeletal and neurological systems. Also, it is controlled by sensory input, central processing, and neuromuscular responses. The balance system involves the coordinated work of vision (eye), positioning (inner ear), bearing surface (deep sense), motor system, central nervous system, and brain. The beginning of the balance system is the perception of our space and position in space. This perception takes place in the form of maintaining balance by activating muscle groups with nerve impulses transmitted to the brain by sensory receptors in the eyes, muscles, joints, and inner ear [2]. Another important issue for balance is the adequacy of proprioceptive senses. Balance is provided by the interpretation of the stimuli obtained from the vestibular, proprioceptive, and visual system (visual) in the central nervous system, the adaptation and sudden reactions of the muscles and the regulation of the body's center of gravity [3, 4].

Dynamic balance is the ability to perform a

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movement while maintaining a position and adjust body positions such as turning, acceleration and deceleration [5, 6]. Motor control ability is especially important in dynamic balance. To improve dynamic balance, there are many types of exercises with non-stationary moving exercises and training tools. By combining these exercise types and customizing them according to various sports branches, many exercise models are emerging in this regard [7].

In combat sports such as boxing, muay thai, kick boxing, the ability to maintain balance and posture is a key factor for success. Athletes in these sports are expected to have good dynamic balance due to branch requirements. Especially in such branches such as boxing and kickboxing where there are more impacts (punches, kicks, etc.), it is difficult to stand and maintain posture. Therefore, it is thought that athletes adapt quickly to this situation [8]. Sport performance in wrestling depends on an important level of technical skills and the level of development of fitness components. Most combat sports, such as the wrestling, require high strength, endurance, and balance. By improving the performance components of strength and balance in wrestling, the aim is to reduce the risk of injury and improve sport performance [9]. In combat sports, it is especially important to be able to make sudden and fast displacement, hand and foot combination with the same skill, or defense and attack at the same time. In addition, it is important to be able to maintain their own body balance while doing these. In kickboxing, situations such as athletes staying on one foot while kicking or even switching to the other foot as a second attack are among the difficult positions of the sport. At the same time, in wrestling, it is one of the difficult positions of the sport for athletes to stay on one leg by holding the opponent while attacking and putting his/her own weight on it. It is thought that it is important to determine the balance performances of athletes who are actively involved in these two combat sports where such challenging movements and techniques are available [10].

There are few studies in the relevant literature focusing on dynamic balance performance. Previous studies have methodological differences in cohorts and measurements. This makes comparisons between studies more difficult. However, discussing the methods applied and the selected cohorts may raise new research questions. Although there are studies on strength, speed, agility, and anaerobic capacity in both sports branches in the literature, there are limited number of studies in which balance parameters are examined in both sports branches. Based on this information, this study aimed to examine the balance performances of wrestling and kickboxing athletes.

Material and Methods

Participants

Fifteen Greco-Roman wrestlers and fifteen kickboxing athletes who participated in national competitions and who were studying at the Faculty of Sports Sciences volunteered to participate in the study. However, two athletes from each discipline were excluded from the study during measurements due to not feeling well at the time of measurement. Participants were informed about the objectives and associated risks of the study. Written informed consent was obtained from all participants, and the study protocol was approved by the Ethics Committee of Selçuk University Faculty of Sports Sciences. (Protocol number 112/26.10.2023)

Descriptive statistics of participants were given in Table 1. Demographic findings including age, height and body weight were similar in all athletes.

Research Design

Participants were instructed not to engage in strenuous exercises 48 hours before the study. Also, participants were not taking any medications or supplements, and they were instructed to maintain their regular dietary intake before the tests. Two days prior to the test day, participants were asked to try the balance device three times to understand the test and become familiar with the device. On the test day, participants were brought to the sports science performance laboratory. Subsequently, height and body weight measurements of the participants were taken. After standard warm-up and stretching

Table 1. Participant Demographics

Data	Groups	N	Mean	Std. Deviation
Age (year)	Kickboxing	13	20.23	2.488
	Wresting	13	20.69	1.316
Height (cm)	Kickboxing	13	177.62	5.026
	Wresting	13	176.00	4.301
Body mass (kg)	Kickboxing	13	77.08	8.441
	Wresting	13	75.54	6.814

exercises, participants underwent dynamic balance assessments on the Biodex Balance System device (BBS, Biodex Medical Systems Inc., Shirley, NY). The collected data were recorded in a computerized format.

Balance Performance Test

Dynamic balance measurements of the participants were conducted with eyes open condition. Participants were instructed to stand on the moving platform of the Biodex Balance System (BBS) with their dominant foot placed precisely in the center, and their arms crossed with hands touching their shoulders. The non-dominant leg was positioned without touching the ground. In this experimental position, participants were asked to maintain a balanced stance on the measurement device, receive feedback from the screen of the measurement device, and have their foot coordinates recorded by the measurement device. These coordinates were considered as the reference point for dynamic balance measurements. Participants were subjected to postural control measurement with eyes open condition. During this measurement, the difficulty level of the measurement tool was set to "Level 5". During the postural control test, participants were instructed to first maintain the test positions and then achieve a balanced posture by looking at the screen of the measurement device. Participants were asked to maintain their balanced positions for 20 seconds during the test. During postural control tests, the Biodex Balance System (BBS) screen was closed, and participants were instructed to look at a marked spot on the wall at eye level, approximately 1 meter away, for 20 seconds. At the end of the test period, the test measurement tool was automatically completed, and the participants' 3 sway scores were recorded: Overall Stability Index (OSI), Anterior-Posterior Stability Index (APSI), Medio-Lateral Stability Index (MLSI). The high scores obtained from BBS express impaired balance performance. Participants who couldn't maintain their posture during the test were re-measured [11].

Statistical Analysis

The data were presented as mean and standard deviation. The normal distribution of the data was tested using the Shapiro-Wilk test. Also, skewness and kurtosis values were checked for data sets that were not normally distributed, and those within ±2 were accepted to be normally distributed. The outputs of the dynamic balance tests of wrestlers and kickboxers were compared using an independent sample t-test. All statistical analyses were conducted using the SPSS software package, version 24.0 (SPSS Inc., Chicago, IL, USA). A significance level (alpha) of <0.05 was considered.

Results

The comparison of dynamic balance performances of kickboxers and wrestlers is presented in Table 2. No significant differences were observed between the groups in OSI (p=0,90), APSI (p=0,14) and MLSI (p=0,17) parameters in the comparison of dynamic balance performance.

Discussion

There are many physical, mental, physiological, and environmental factors affecting balance in athletes. In general, branch-specific training methods, injury conditions, muscular structure, fitness and coordination skills, somatotype characteristics, reaction time of the vestibular system to various stimuli, proprioceptive sensory perception and impact to the head area, concussion, accidents, etc. are among the factors affecting the balance that are related to the vestibular system [12, 13]. A suitable motor response requires an intact neuromuscular system and sufficient muscular strength to return the center of mass to the base of support when balance is disturbed. Under both static and dynamic conditions, control of balance is considered a fundamental requirement for physical and daily activities [14].

In combat sports, sudden and rapid displacement, hand and foot combination with the same skill, or the ability to defend and attack at the same time,

Table 2. Comparison of dynamic balance performances

Parameters	Group	Mean	Std. Deviation	t	95% Confidence Interval of the Difference		P
					Lower	Upper	
OSI (scores)	Kickboxing	2.63	0.66	-.120	-0.561	0.50	0.90
	Wresting	2.66	0.64				
APSI (scores)	Kickboxing	1.93	0.69	1.512	-0.129	0.83	0.14
	Wresting	1.58	0.48				
MLSI (scores)	Kickboxing	1.35	0.46	-1.413	-0.605	0.11	0.17
	Wresting	1.60	0.41				

OSI: Overall Stability Index; APSI: Anterior-Posterior Stability Index; MLSI: Medio-Lateral Stability Index

it is important to provide their own body balance while doing these. In kickboxing, situations such as athletes staying on one foot while kicking or even switching to the other foot as a second attack are among the difficulties of the sport [15, 16]. At the same time, athletes staying on one leg by holding the opponent while attacking and putting their own weight on it is one of the positions where balance is difficult to achieve in wrestling. It is stated that it is of great importance to determine the balance performance of athletes who are actively involved in these two combat sports with such challenging movements and techniques [15, 17]. Therefore, this study aimed to examine the balance performances of wrestling and kickboxing athletes.

In the studies conducted so far, various devices and methods have been used to determine balance performance. Today, different devices and systems continue to be used to evaluate dynamic balance, which is very important for combat sports. For this purpose, Biodex Balance System (BBS), which has high reliability and validity, was used in this study. Parameters such as OSI, APSI and MLSI were determined through this device. Thus, balance performances of athletes in two different combat sports were compared. The main finding of our study was that there were no significant differences in all parameters in athletes of both sports.

It is known that it is important to evaluate the balance performance in many sports branches. For this reason, many studies have been conducted so far on the evaluation of balance performance. Tatlıcı and Ünlü [18], in their study aiming to examine the effects of Proprioceptive Neuromuscular Facilitation (PNF) applications on dynamic balance indices with 7 national wrestlers between the ages of 18-25, concluded that PNF applications did not cause a difference in dynamic balance performance values in the dominant leg and that there was no statistically significant difference in APSI and OSI values, although a significant increase was observed in MLSI values in the nondominant leg. Özer [19] explained in his study that there was no statistically significant difference in static and dynamic balance before and after fatigue because wrestlers' balance was not affected by muscle fatigue. Anaerobic power and capacity are very important for wrestlers who want to have a high level of performance because during a wrestling match, high intensity repetitive actions are needed and the energy for these actions comes from anaerobic energy systems [20]. In this context, İri et al. [21] conducted a study on 17 female wrestlers and had them perform metabolic fatigue wrestling before and after balance measurements. as a result of the study, they found a statistically significant difference in post static and dynamic balance parameters. Davlin [22] reported in a study that gymnasts performed better in dynamic balance performance than soccer players and swimmers. Bressel et al. [23] found that gymnasts and soccer players did not differ in terms of static and dynamic balance. They also stated that basketball players showed lower static balance performance compared to gymnasts and lower dynamic balance performance compared to soccer players. Erkmen et al. [24] found that the balance performance of gymnasts was higher than basketball players, while only dynamic balance performance was more developed than soccer players. They also determined that the balance performances of soccer players were close to both basketball players and gymnasts, and that basketball players and soccer players had similar characteristics in terms of balance performance. Gökdemir et al. (1) found that the static balance performance of basketball players was lower than volleyball and soccer players, while their dynamic balance performance was higher. According to the results of the studies in the literature, it can be said that balance performance shows differences in many branches. Khuman et al. [25] found significant differences between male cricket, soccer, and volleyball players in terms of static and dynamic balance performances. They stated that soccer players showed higher balance performance than volleyball players, while volleyball players showed higher balance performance than cricket players in terms of both static and dynamic balance. According to the results of the studies in the literature, it can be said that balance performance shows differences in many branches.

Although the importance of balance for performance in combat sports is known, there are limited number of studies on dynamic balance for combat sports in the literature. Şimşek [8] found that there was no significant difference between the static and dynamic balance values of combat sports athletes and athletes in other sports. Gençay et al. [26] determined that young judoists and wrestlers had higher static and dynamic balance scores than athletes in other sports. They also stated that judoists had better static and dynamic balance performance than wrestlers. In our study, there were no significant differences in all parameters in the comparison of dynamic balance of kickboxers and wrestlers. Thus, it can be said that various combat sports have specific effects in terms of dynamic balance performance.

Conclusions

According to the findings suggest that despite the distinct technical demands and training regimens inherent in kickboxing and wrestling, both athlete cohorts exhibit similar proficiency in maintaining dynamic balance. Such parity challenges possible assumptions regarding potential disparities in balance performance between these disciplines. Understanding the similarities in dynamic balance proficiency among kickboxers and wrestlers is pivotal

for sports practitioners and coaches in devising training programs tailored to enhance athletes' balance capabilities effectively. Additionally, these results underscore the importance of comprehensive balance training across various combat sports disciplines, transcending traditional boundaries.

Further investigations may investigate nuanced factors influencing dynamic balance within each sport and explore interdisciplinary approaches to optimize athletes' balance performance. By doing so, we can advance not only our comprehension of athletic balance but also refine training methodologies to promote overall performance and mitigate injury risk in kickboxing and wrestling athletes.

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