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The link between mindfulness, static and dynamic balance among elite athletes

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ABSTRACT

The current study seeks to investigate the link between mindfulness, static and dynamic balance among elite athletes. 77 elite athletes (M_{age} = 19.03 years, *SD* = 3.00) completed a Demographic Information Form and the Mindfulness Inventory for Sport. In addition, Y Balance Test and Flamingo Test were used for balance measurements. Simple correlation analysis indicated that overall mindfulness was not significantly related to dynamic and static balance. However, the awareness subscale of mindfulness was negatively correlated with dynamic balance. In addition, the results of the regression showed that the awareness subscale of mindfulness significantly predicted dynamic balance. Findings suggest that awareness, albeit low, may be an important predictor of dynamic balance in elite athletes.

Keywords: Mindfulness, static balance, dynamic balance, elite athletes.

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INTRODUCTION

It is thought that physical, physiological, and psychological issues may affect athletic performance and success in sports. Evaluating the stated issues with a holistic approach is important to support athletic performance development in many ways (Bozkurt, 2010).

From physical states, balance is the process of maintaining the position of the body's center of gravity in the desired position on the base of support. It relies on rapid, continuous feedback from visual, vestibular, and somatosensory structures, followed by smooth and coordinated neuromuscular actions (Hrysomallis, 2011). Studies on the balance of athletes have mostly been evaluated with physical and physiological parameters (Hrysomallis, 2007), we can consider that the risk of falling injury is affected by psychological factors such as stress, ambition to win, low motivation, and deteriorated concentration, albeit indirectly. We can reach clearer information on the subject by conducting studies examining the relationship between balance and psychological factors in the literature. Our current knowledge of this subject is limited. An important way to enhance performance is mental training such as imagery, arousal control, and self-talk (Bühlmayer et al., 2017). Mindfulness, which is one of the new generation mental training, is the awareness that occurs in the present moment, without judgment, for conscious attention to the experiences that occur moment by moment (Kabat-Zinn, 2003). There is evidence that increased mindfulness is associated with increased perceived performance (Moen et al., 2015).

It has been stated that the ability to initiate and maintain the action in static and dynamic balance tasks in a fixed position or motion is associated with the level of cognitive awareness, those with higher awareness perform better, and there is a positive relationship between awareness and performance (Rosenstreich et al., 2018). Bühlmayer et al. (2017) concluded that with mindfulness or mindfulness-based practices, improvements were observed in the psychological and physiological performances of athletes over the age of 15 and that it had a positive contribution to performance, especially in branches that require attention and concentration such as dart shooting and archery.

It can be thought that there may be a relationship between balance and mindfulness parameters, as they are important factors in the development of athletic performance and include similar psychological components such as attention, awareness, coordination, and motivation. As a result of the literature review, it was thought that there may be a relationship link mindfulness and balance of elite athletes. The limited number of studies examining the relationship between balance and mindfulness in athletes shows the importance of the study. The current study may contribute to the field by looking at the subject of athletic performance holistically in terms of physical and psychological aspects.

METHOD

Design

Ethical approval was gained from the University of Erzincan Binali Yıldırım Health and Sport Sciences Ethical Committee (date/number; 31 December 2021/10). The current study was carried out with adult elite athletes in Ankara, Turkey. Data collection was online, through Google Forms. Participants completed a Demographic Information Form created by the researchers and the Mindfulness Inventory for Sport (Thienot et al., 2014). Dynamic and static balance measurements were made in the laboratory environment right after the measurement tools were answered. All participants obtained informed consent. Data were collected from April to June 2022.

Participants

We conducted a power analysis to estimate the sample size required for adequate statistical power. In order to detect a medium Pearson's correlation coefficient of r = .35 with 85% power (alpha = .05, two-tailed), G*Power suggests we would need 70 participants. Pearson's correlation coefficient was set to r = .35 based on the study by Kee et al. (2012). Considering the dropout rate, the sample was increased by around 10%. As a result, 77 elite athletes from different sports branches were included in this study (Table 1). The participants had a mean age of 19.03 years (SD = 3.00), 173.41 height (SD = 9.18), and 72.02 weight (SD = 15.32) (Table 1). The participants had a mean age of 19.03 years (SD = 3.00), 173.41 height (SD = 9.18), and 72.02 weight (SD = 15.32).

Instruments

Demographic information form

The Demographic Information form, which is created by researchers, included questions regarding the participants' gender, height, weight, age, sports branch, and best records to date in their sports branch.

Table 1. Demographic information of the participants.

Group	*N*	%
Gender		
Female	32	41.6
Male	45	58.4
Sport Branch		
Weightlifting	9	11.7
Track and field	8	10.4
Canoe	11	14.3
Curling	7	9.1
Sailing	6	7.8
Ice-skating	3	3.9
Tennis	12	15.6
Handball	1	1.3
Soccer	6	7.8
Arm wrestling	2	2.6
Fencing	1	1.3
Basketball	2	2.6
Karate	2	2.6
Kickbox	2	2.6
Taekwondo	1	1.3
Judo	2	2.6
Wrestling	2	2.6
Best Athletic Record		
National Record	47	61.0
European Record	18	23.4
World Record	11	14.1
Olympic	1	1.3

Mindfulness inventory for sport (MIS)

The Mindfulness Inventory for Sport (MIS) was used to assess mindfulness. MIS was developed by Thienot et al. (2014) and adapted to Turkish by Tingaz (2020a). The 15-item MIS has three sub-scales: Awareness (e.g. I am aware of the thoughts that are passing through my mind), Non-judgment (e. g. When I become aware that I am thinking about a past performance, I criticise myself for not being focused on my current performance), and Refocusing (e. g. When I become aware that some of my muscles are sore, I quickly refocus on what I have to do). The item format was a 6-point Likert scale ranging from 1 (not at all) to 6 (very much). The Cronbach's Alpha was calculated as .81 for the Awareness subscale, .70 for the Non-Judgment subscale and .77 for the Refocusing subscale. As a result of the test-retest of MIS, it was found that the scale was consistent over time (Tingaz, 2020a). The scale was negatively correlated with irrational performance beliefs (Tingaz, 2020b), anxiety, stress, and depression (Tingaz et al., 2022), rumination (Tingaz and Çakmak, 2021), impulsivity (Tingaz et al., 2020), and positively correlated with cognitive flexibility (Tingaz, 2020b), self-compassion (Tingaz and Çakmak, 2021), and self-rated performance (Tingaz et al., 2022). For this study, Cronbach's Alpha was calculated as .82 for the Awareness subscale, .80 for the Non-Judgment subscale and .81 for the Refocusing subscale.

Dynamic and static balance

Y balance test

The Lower Extremity Y Dynamic Balance Test material consists of three PVC pipes with anterior, posteromedial and posterolateral extension directions connected to a central platform (balance point) and three PVC blocks placed in these pipes. The pipes in the posterior directions of the platform (posteromedial and posterolateral) are positioned to be 45° between themselves and 135° from the pipe in the anterior direction. In order to determine the distance that the athletes can reach, there are distance meters at 1mm intervals on the pipes in the anterior, posteromedial and posterolateral directions connected to the platform. The test was applied to the dominant feet of the participants. The participants stood in balance with their bare feet bare, with their hands kept fixed in the waist area on the Y dynamic balance test platform, and their feet at the center point, wearing sports clothes that would not restrict their movements. Then, maintaining his fixed stance with one foot, he pushed the blocks with the tip of his toe (by bringing the foot back to the fixed stance point without touching the ground each time) in the anterior (0°), posteromedial (45°) and posterolateral (45°) directions with the other foot. After the test was repeated 3 times in all three directions (anterior, posteromedial, posterolateral), the normalization formula was used (Türkeri et al., 2020). The lower extremity length (limb length) for each participant was recorded by measuring the distance between the spina iliaca anterior superior and the malleolus medialis, with the athlete in a relaxed supine position, with a tape measure (Stiffler et al., 2015).

Normalization Formula: (Anterior + Posteromedial + Posterolateral)/(3×Limb Lenght)×100

Flamingo test

A stopwatch, a 50 cm long, 4 cm high and 3 cm wide board was used as equipment (Eurofit, 1988). During the test, while the participant was standing on the board with his dominant foot, he was asked to raise the other foot from the ground and bring the knee to maximum flexion with the same hand and hold it. During the measurement, he was asked to focus on a point at eye level. The moment the participant let go of the hand of the trainer he received support from, the stopwatch was started and the measurement started. The stopwatch was stopped when the participant let go of his hand or any part of his body touched the ground. The trainer assisted the participant to put himself in the correct position following each balance disturbance. A total of 3 tests were performed and the average value was recorded. As scoring, the number of mistakes made during 1 minute was taken and noted. (Kranti Panta, 2015; Şimşek and Karakuş, 2020). The tests were applied in the Performance Measurement Laboratory of the Türkiye Olympic Preparation Center in Ankara.

Data analysis

We used IBM SPSS 26.0 for data analysis. Initially, assumptions of normality in the data distribution were tested with Q-Q Plot Graphs, Histogram, and skewness-kurtosis coefficient. The data is distributed normally. As a result of the normal distribution of the data, we used the Pearson correlation test to examine the relationship between mindfulness, sports year, static and dynamic balance. Since there is a relationship between the awareness subscale of mindfulness and dynamic balance, we tested the predictive power of mindfulness with simple linear regression. We observed no multicollinearity.

RESULTS

As shown in Table 1, the participants had a mean age of 19.03 years (SD = 3.00), 173.41 height (SD = 9.18), and 72.02 weight (SD = 15.32).

Table 2 shows the Pearson correlation coefficients between mindfulness subscales and static and dynamic balance. There was a negative significant correlation between the awareness subscale of mindfulness and dynamic balance ($r = -.227$, $p < .01$). In addition, the awareness subscale of mindfulness was positively correlated with dynamic balance (.270, $p < .05$). However, there was no significant correlation between mindfulness and subscales of mindfulness, sports year, and dynamic and static balance ($p > .05$).

The results of the regression showed that the awareness subscale of mindfulness significantly predicted dynamic balance ($\beta = .227$, $p < .05$) and the

Table 2. Correlation between mindfulness and the subscale of mindfulness, dynamic and static balance, sports year.

Variable	1	2	3	4	5	6	7
1. Dynamic Balance	-						
2. Static Balance	-.082	-					
3. Awareness	-.227*	-.173	-				
4. Non-Judgment	.135	.040	-.396**	-			
5. Refocus	-.187	-.035	.681**	-.338**	-		
6. Mindfulness	-.140	-.087	.672**	.287*	.726**	-	
7. Sports year	-.005	-.169	.270*	-.022	.124	.205	-

**$p < .01$, *$p < .05$.

Table 3. Simple linear regression analysis on awareness subscale of mindfulness as a predictor of dynamic balance.

Predictor variable	*R*	R^2	*B*	Standard error	*β*	*t*	*p*	
Invariant			-5.415	.112			.000	1.000
Awareness	.227	.051	2.15	.112	.227	4.071	-2.018	.047

Invariant: Dynamic Balance.

model explained 5% of the variance (Table 3).

DISCUSSION AND CONCLUSION

In this study, we examined the link between mindfulness, dynamic and static balance in elite athletes. Our findings suggest that there was no significant relationship between mindfulness and static and dynamic balance in elite athletes. Sports year was also not associated with static and dynamic balance. However, a negative correlation was found between the awareness subscale of mindfulness and dynamic balance. In the literature, no direct relationship-seeking study has been found in the current situation. This situation caused the discussion to be limited. Some study results that are parallel to our research topic are as follows.

Kee et al. (2012) reported that mindfulness is not one of the main factors on postural balance, there is no relationship between them, but mindfulness exercises have a facilitating effect in providing postural control as it causes external focus. Although postural balance is only one of many types of motor behavior that humans can engage in, it has been reported that momentary awareness has a beneficial effect on behavioral control because it affects performance and the use of attention strategy. In a study conducted with university students, there was no relationship between dynamic balance, static balance and mindfulness, while a negative significant relationship was found with static balance in students with attention deficit and hyperactivity in the awareness subscale (Rosenstreich et al., 2018). While the evidence to support a direct impact of mindfulness on athletic performance is minimal, many studies show gains in precision sports such as shooting and dart throwing. These performance improvements have been associated with reductions in anxiety, greater relaxation, and improvements in motor control (Anderson et al., 2021). Mindfulness exercises support performance development by improving motor control in athletes and contributing to the practice of motor skills quickly and efficiently, independent of internal and external stress factors. It is also known to improve endurance performance and cognitive functions (Nien et al., (2020). When the literature is examined in more detail, it is seen that mindfulness exercises (for 4 weeks, 6 weeks and 8 weeks) have both psychological (anxiety, stress, well-being, bodily awareness) and physiological parameters (heart rate, oxygen capacity, balance, etc.). It is reported that it contributes to the development of athletic performance by affecting recovery, motor skills, etc. (Carraça et al., 2018). In order to determine how alternative types of instruction given during a 6-week balance exercise program affect mindfulness, balance exercise and internally focused training were applied to one group, and balance exercise and externally focused training were applied to the other group. As a result, it was stated that internally focused training with balance was more effective than externally focused training in raising awareness and it could be an alternative to meditation as a way to improve awareness (Pantano and Genovese, 2016). Vural and Okan (2021) found that there was a low positive correlation between the year of sports, refocus and mindfulness in shooters. According to Özyürek (2021), a negative relationship was observed between mindfulness and posture control in healthy adults.

In conclusion, the awareness subscale of mindfulness, albeit low, may be an important predictor of dynamic balance. The fact that there was no study examining the relationship between mindfulness and static and dynamic balance directly situationally in our study caused it to be limited in terms of supporting the findings. But it seems that mindfulness practice is an increasingly popular intervention for athletes to improve their mental skills and improve performance. Recent research suggests that the practice of mindfulness can provide a tool to support the physical and mental well-being of the athlete. Mindfulness has been shown to reduce stress and anxiety among athletes and can contribute to increased performance, especially in sensitive sports. With its growing popularity, very low risk of harm, and emerging evidence of efficacy for athletes, mindfulness represents a potentially valuable modality for athlete health and performance. Further research is needed to better define its effect on overall performance or specific skills that affect performance in athletes.

Limitations

A few limitations should be mentioned in the study. It is difficult to make a causal inference in this cross-sectional study. Lack of biopsychosocial information about the family or social environment of the participants. Additionally, the variables were not evaluated in terms of gender.

Declaration of conflicting ınterests

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Informed consent

Informed consent was given to all participants in order to get their allowance for this study.

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