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Does Functional Movement Analysis and Balance Have A Relationship With Body Awareness Level?

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ABSTRACT

This study was carried out to examine the relationship between functional movement analysis and dynamic balance and body awareness levels in active athletes.

24 active athletes who train at least 5 days a week participated in the study. Functional Movement Screen (FMS) (Functional Movement Screen) consisting of 7 movements was applied to the participants. Dynamic balance were measured with Y-Balance Test (YBT) and body awareness were established with Body Awareness Questionnaire (BAQ).

SPSS (Statistical Package for the Social Sciences) 26.0 package program was used for statistical analysis of the data. Descriptive statistics were given as mean and standard deviation. Spearman correlation analysis was used to determine the relationship between the variables.

A moderate positive correlation (r=.671; p<.000) was found between FMS and BAQ, and FMS and the other parameters. In addition, moderate relationship was determined between BAQ and YBT in the dominant foot anterior (A), posteromedial (PM), posterolateral (PL) and composite values.

In conclusion, as BAQ levels increase, athletes' FMS scores and only YBT values of dominant leg increased. In addition, as the FMS scores increased the YBT scores except for the anterior right (AR) and left (AL) leg also increased. Because of the positive relationship between FMS, YBT and BAQ, it is thought that controlling FMS, YBT and BAQ can give coaches important clues to predict the injury risk of athletes.

Keywords: *Functional movement analysis, Dynamic balance, Body awareness*

INTRODUCTION

Sport is a tool that is done individually or collectively, that improves the abilities of individuals by providing their physical, mental, emotional and social development, and is performed within the framework of predetermined rules with the desire to compete with another or to reach a determined goal (Kızılelmas, 2021). Today, the probability of individuals involved in active sports not being injured is almost non-existent. In some studies, the quality of movement and athletic performance of the athletes have been associated with the risk of injury (Mens et al 1999, Kraemer et al. 2004), and the faultinesses in basic movement patterns have been associated with sports injuries (Cholewicki et al 2005; Kraemer et al. 2004). Functional Movement Screen (FMS) is one of the methods used to evaluate stability and quality of lower and upper extremity movement patterns in athletes, since poor neuromuscular control increases the risk of acute injury (Cook et al. 2014a, Koehle et al. 2016). FMS offers the opportunity to clinically evaluate parameters such as balance, strength, flexibility to predict injury. It evaluates individuals in terms of dynamic and functional capacity, and by identifying deficiencies during movements, it can provide advance information in terms of injuries that individuals may experience during physical activity and allow them to be avoided (Cook et al. 2014a, Koehle et al. 2016). FMS is a scale that evaluates movement patterns in a practical and dynamic way, and easily and quickly evaluates muscle strength, joint range of movement, movement asymmetry, body strength and stabilization, range of movement, balance, coordination, flexibility level and kinesthetic awareness (Shields et al. 1989, Cook et al. 2014a, Cook et al. 2014b, Koehle et al. 2016). Posture assessment in FMS aims to obtain information about individual movement patterns and to determine movement limitations and restrictions. Therefore, FMS is used as a screening tool to develop exercise programs focused on injury, prevention, rehabilitation and performance improvement in sports (Kiesel et al 2007).

Balance is the main component of motor skills in both daily activities and sports (Alghadir et al. 2018). Balance, which is very important for athletes, can be defined as the ability to maintain the center of gravity with instant postural minimum oscillation (Zemková, 2014). Balance is the process of maintaining the position of the body's center of gravity vertically on the base of support and It relies on rapid, continuous feedback from visual, vestibular, and somatosensory structures, followed by smooth and coordinated neuromuscular actions (Hrysomallis 2011). Balance is divided into static and dynamic balance. Static stability is the ability to maintain a base of support with minimal movement. Dynamic balance is expressed as the ability to perform a task while maintaining or regaining a fixed position (Winter et al. 1990) or the ability to maintain and regain balance with minimal external movement on an unstable surface (Kioumourtzoglou et al. 1997; Paillard et al. 2006) (Hrysomallis 2011). It is reported that balance skill is a determining factor in the development of motor skills. Static and dynamic balance play an active role in the use of motor skills (Khasawneh, 2015); Moein and Movaseghi, 2016).

When the literature is examined, it is seen that FMS and YBT have been used in recent studies to determine the risk of injury in terms of sports branches (Moran et al., 2017; . Smith et al., 2015). While FMS provides information about trunk stability, range of movement and dynamic balance, YBT is only used to evaluate dynamic balance. In the literature, the relationship between FMS and YBT in healthy individuals has been examined and it has been reported that the two tests are partially related (Kelleher et al., 2017).

Body awareness is the expression of an individual's awareness of body parts or dimensions. As the individual's awareness of mind and body interaction improves, respiratory control, mental control, emotional control, increased coordination, improvement in muscle and joint movements, and improvement in response predictions due to changes in the body are expected (Ginzburg et al 2014, Mehling et al 2011). The individual's awareness of his body starts with learning how to use his body with motor learning during functional movements. Later, factors such as speed, strength, distance, coordination, which affect the quality of the movement, also develop and body awareness begins to develop by entering into a close relationship with all factors (Bekker et al 2002). When the literature is examined, it is seen that treatments on body awareness reduce pain, appetite and eating problems, fatigue, sleep problems, increase the quality of exercise, coordination, balance, postural control, quality of life, and mind-body integration (Neumark-Sztainer et al. 2011, Gard 2005). Shields et al., who developed the Body Awareness Questionnaire (BAQ), emphasized that the scales evaluating body awareness before the BAQ were limited to the concepts of sensitivity to somatic responses related to the individual's disease processes, other physical symptoms, or emotional states and thoughts (Shields et al 1989). Mehling et al. (Mehling et al. 2009) stated that BAQ includes more emotional and physical components than other measurement tools used to evaluate body awareness (Mehling et al. 2009).

This study is important in terms of revealing the relationship between body awareness and FMS, which is used in dynamic balance and disability risk, which affects performance in active sports individuals. In this sense, professional teams (physiotherapist, etc.) are needed for FMS measurements. Investigating the relationship in all three components (FMS, YBT and BAQ) will provide information, albeit superficially, about the general health of the athletes with an effortless questionnaire. It can be said that as body awareness increases, the continuity of general alertness and being in the moment will increase, so an increase will be seen in dynamic balance values, and at the same time, Functional Movement Screen (FMS) results will be more successful.

MATERIAL METHOD

Research Group

The study was composed of 24 participants, between the ages of 15-22, residing in Sakarya, who practiced at least 4-5 days a week, participated in national and international competitions, and engaged in active sports. The height measurements of the participants were made with a Seca brand 213 model stadiometer (Hamburg, Germany). Body weights were taken with Tanita brand MC780 Black model body analyzer (Tokyo, Japan). Body mass index (BMI) was determined by dividing the body weight by the square of the height (kg/m²). All measurements were made with bare feet, shorts and T-shirt. In addition, the dominant leg of the athletes was determined. The dominant foot is the foot that is hit by "asking the person to hit the ball", which is one of the dominant leg detection methods (Huurnink et al., 2014 (Paillard, 2020). As a result of the dominant foot test, it was determined that the dominant legs of all the athletes were the right leg and they were recorded.

The study was approved by Gazi University Ethics Committee with the decision no. E.663329 dated 23.05.2023.

Dynamic Balance (YBT)

Dynamic balance measurement was measured with Y Balance Test (YBT). First of all, leg length measurements were taken from the participants in cm. In the balance measurement, the participant was asked to stand on one foot (the foot to be tested on the floor) at the midpoint of the test setup and drag the material of the test setup with the tip of the toe without disturbing the balance with the other foot in the anterior (A), posteromedial (PM) and posterolateral (PL) directions. During the test, the participants were asked not to separate their hands from the iliac crest and their heels from the floor. The test was repeated 3 times in all directions and the best grade was recorded in centimeters. A 1-minute rest interval was given between two trials. All reach distances were recorded in centimeters. The tests were taken from both sides, right and left foot. After the data were obtained, in order to eliminate the leg length difference, normalized scores were obtained for each direction by means of the formula (Best Reach/Leg Length)x100 = maximum reach distance (Gribble and Hertel, 2004). The total score value (Composite) was calculated by taking the average of the normalized A, PM and PL scores. The validity reliability of the test was determined by Plisky et al. (2009), with the ICC range as intrarater 0.85-0.01 and the interrater range as 0.99-1.00 (Plisky et al., 2009).

Functional Movement Screen (FMS)

The FMS levels of the athletes were determined using the Functional Movement Screening Test kit developed by Gray Cook (1988) within the scope of this research (Osaka et al., 2011). The 7 basic movements in this test are Deep Squat, Hurdle Step, In Line Lunge, Shoulder Mobility, Active Straight Leg Raise, Trunk Stability Push Up, Rotary Stability in order (Figure 1). The FMS test applied to the participant groups was performed by a certified Physiotherapist. The measurements were applied to the athletes without warming up. Before the test, the athletes were informed about the test by the expert, and the movements were shown in detail. Each movement was repeated three times during the test. Participants were asked to indicate any pain or discomfort that may occur during the execution of the test. In the test, firstly, unilaterally evaluated movements (deep squat, push-up test) were measured. In the bilaterally tests (hurdle step, in line lunge, shoulder mobility, active straight leg raise and rotation stability) scores were made separately as right and left. During the scoring, the scores of the participants from both body directions were recorded. However, the lowest score received from the movement was accepted as the result of the test. For example, the score of the athlete who got the left leg score of 1 and the right leg score of 2 was recorded as 1 in the hurdle step. This procedure has been applied for bilateral movements (Cook et al. 2010). In the scoring of functional movement screening, each test is scored in itself and the FMS score is the sum of the seven tests applied. While testing FMS movement forms, 3 tests are used to define pain (Kiesel et al., 2007). In the test, each movement is given a score between 0-3, the highest score that can be obtained from the test is 21, and the lowest score is 0 (Cook et al., 2006). Individuals with a FMS total score lower than 14 points have a higher risk of injury than individuals with a higher than 14 points (Kiesel et al., 2007).

Tests	3 points	2 points	1 point	0 points
Deep squat	Upper torso is parallel with tibia or toward vertical. Femur is below horizontal. Knees are aligned over feet. Dowel is aligned over feet.	Meet criteria of 3 points with 2 × 6 board under heels. Knees are not aligned over feet.	Tibia and upper torso are not parallel. Femur is not below horizontal. Knees are not aligned over feet. Lumbar flexion is noted.	If pain is associated with any portion of this test.
Hurdle step	Hips, knees, and ankles remain aligned in sagittal plane. Minimal to no movement is noted in lumbar spine. Dowel and hurdle remain parallel.	Alignment lost between hips, knees, and ankles. Movement is noted in lumbar spine. Dowel and hurdle do not remain parallel.	Contact between foot and hurdle occurs. Loss of balance is noted.	If pain is associated with any portion of this test.
In-line lunge	Minimal to no torso movement is noted. Feet remain in sagittal plane on 2 × 6 board. Knee touches 2 × 6 board behind heel of front foot.	Movement is noted in torso. Feet do not remain in sagittal plane. Knee does not touch behind heel of front foot.	Loss of balance is noted.	If pain is associated with any portion of this test.
Shoulder mobility	Fists are within 1 hand length.	Fists are within 1.5 hand length.	Fists are not within 1.5 hand lengths.	If pain is associated with any portion of this test and/or during shoulder stability screen.
Active straight-leg-raise	Dowel resides between mid-thigh and anterior superior iliac spine.	Dowel resides between mid-thigh and jointline of knee.	Dowel resides below jointline.	If pain is associated with any portion of this test.
Trunk-stability push-up	Males perform 1 repetition with thumbs aligned with top of head. Females perform 1 repetition with thumbs aligned with chin.	Subjects perform 1 repetition in modified position. Male-thumbs aligned with chin. Female-thumbs aligned with chest.	Subjects are unable to perform 1 repetition in modified position.	If any pain is associated with any portion of this test. If pain is noted during lumbar extension.
Rotary stability	Subjects perform 1 correct repetition while keeping torso parallel to board and elbow and knee in line with board.	Subjects perform 1 correct diagonal flexion and extension lift while maintaining torso parallel to board and floor.	Subjects are unable to perform diagonal repetition.	If pain is associated with any portion of this test. If pain is noted during lumbar flexion.

FIGURE 1: Scoring System for Functional Movement Screen (Osaka et al., 2011)

Body Awareness Questionnaire (BAQ)

The BAQ, originally called the Body Awareness Questionnaire, is a questionnaire widely used in research for various populations, mainly questioning body responses, an individual's predictions about bodily processes, the disease process, and the sleep-wake cycle. It was developed in 1989 by Stephanie A. Shields, Mary E. Mallory, and Angela Simon (Shields et al. 1989). Body Awareness Questionnaire is a 7-point Likert-type questionnaire consisting of 18 items and 4 subgroups. In its original 18-item version, it includes 4 subgroups: 1. Estimation of body responses 2. Sleep-wake cycle 3. Prediction at the onset of illness 4. Paying attention to changes in body processes and responses. Participants are asked to score between 1-7 for each of the 18 statements in the questionnaire (1=not at all true for me, 7=completely true for me). The total score to be obtained from the questionnaire can be at most 126 and at least 18. Rating in the questionnaire is done as a total score. The higher the score obtained from the questionnaire, the better the level of body awareness (Shields et al. 1989).

RESULTS

The means of all the values of the participants are given in **Table 1**.

TABLE 1: Descriptive Statistics Results of Athletes

Variables	Min Value n=24	Max. Value n=24	Mean n=24	Standard Deviation n=24
Age (year)	16,00	20,00	18,08	1,35
Height (cm)	160,00	187,00	175,25	6,63
Body Weight (BW) (kg)	55,00	96,60	73,23	10,58
Body Mass Index (BMI) (kg/m^2)	19,65	29,81	23,80	2,84
Body Awareness Questionnaire (BAQ)	66	115	98,33	11,67
Functional Movement Screen (FMS)	15	19	17,25	1,15
Anterior Left (AL)(cm)	56,00	76,00	63,22	6,13
Anterior Right (AR) (cm)	50,00	77,50	63,52	8,02
Posteromedial Left (PML) (cm)	95,00	140,00	117,08	13,06
Posteromedial Right (PMR) (cm)	102,00	140,00	117,89	13,53
Posterolateral Left (PLL) (cm)	99,00	142,00	115,35	12,47
Posterolateral Right (PLR) (cm)	95,50	140,00	115,69	13,18
Composite Left (CL) (cm)	66,60	129,80	108,67	13,81
Composite Right (CR) (cm)	82,95	136,47	109,95	14,49

TABLE 2: Relationship between FMS and BAQ Scores and Age, Height, Body Weight and BMI

Parameters	Age n=24	Height n=24	Body Weight n=24	BMI n=24	FMS n=24	BAQ n=24
Age (Year)	1	,118	,385	,290	,670**	,630**
Height (cm)		1	,534**	,019	,030	031
Body weight (Kg)			1	,810**	,056	,341
BMI (kg/m^2)				1	,084	,477*

***p<0,05 **p<0,01**

According to the Spearman correlation analysis performed to determine the relationships between FMS and BAQ scores and age, height, body weight and BMI, it was determined that there is a moderate positive correlation between Age and FMS (r= .670; p<.001), Age and BAQ (r= .630, p<.001) and Height and body weight (r= .534; p=.007), there is also a strong positive correlation between body weight and BMI (r= ,810; p<,001) and there is a weak positive correlation between BMI and BAQ (r= .477; p<.018). No statistically significant relationship was found between other variables (**Table 2**).

TABLE 3: Relationship between Dynamic Balance Parameters and Age, Height, Body Weight and BMI

Parameters	Age (Year) n=24	Height (cm) n=24	Body weight (Kg) n=24	BMI (kg/m^2) n=24
Anterior Left (AL)	,020	-,092	,264	,301
Anterior Right (AR)	,230	-,053	-,014	,041
Posteromedial Left (PML)	,271	,204	-,046	-,137
Posteromedial Right (PMR)	416*	-,077	-,138	-,038
Posterolateral Left (PLL)	,201	-,021	-,162	-,088
Posterolateral Right (PLR)	,342	-,316	-,208	,009
Composite Left (CL)	,319	-,429*	-,171	,100
Composite Right (CR)	,470*	-,386	-,181	,055

***p<,05**

A positive correlation was found between age and PMR (r=.416 p<.043) and CR (r=.470 p<.020) in Table 3. A positive correlation was also found between the height parameter and CL (r=.429 p<.037). No statistically significant relationship was found in terms of other parameters.

TABLE 4: Relationship between FMS, BAQ Scores and Dynamic Balance Parameters

Parameters	1	2	3	4	5	6	7	8	9	10
1. FMS	1	,671**	-,199	,244	,523**	,695**	,422*	,605**	,588**	,756**
2. BAQ		1	,078	,421*	,169	,469*	,280	,409*	,330	,567**
3. Anterior Left (AL)			1	,622**	-,164	-,038	-,359	-,173	,022	,071
4. Anterior Right (AR)				1	-,016	,207	-,086	-,020	,147	,329
5. Posteromedial Left (PML)					1	,788**	,712**	,699**	,692**	,568**
6. Posteromedial Right (PMR)						1	,712**	,862**	,801**	,829**
7. Posterolateral Left (PLL)							1	,687**	,693**	,519**
8. Posterolateral Right (PLR)								1	,843**	,852**
9. Composite Left (CL)									1	,875**
10. Composite Right (CR)										1

***p<0,05, **p<0,01**

A moderate positive correlation was found between FMS and BAQ scores (r=.671 p<.000) in Table 4. Considering the FMS and Balance parameters, a positive correlation was found between PML (r=.523 p<.009), PMR (r=.695 p<000) PLL (r=.422 p<.040), PLR (r=.605 p<.002), CL (r=.588 p<.003) and CR (r=.756 p<.000), respectively. There was no statistically significant relationship between FMS and AR and AL.

Considering the relationship between BAQ and Balance Parameters, a positive relationship was found between AR (r=.421 p<.040), PMR (r=.469 p<.021), PLR (r=.409 p<.047) and CR (r=.567 p<.004), respectively. No statistical correlation was found between BAQ and AL, PML, PLL, CL.

DISCUSSION

It has been evaluated whether FMS and YBT are related to BAQ in this study. It has been emphasized that studies on the relationship between FMS and YBT are partially positively related to each other in the literature review. However, no study evaluating the relationship between FMS and YBT values and BAQ was found. Therefore, the relationship between FMS and BAQ and between YBT and BAQ was investigated in our study. In addition, the relationship between age, height, body weight, and body mass index (BMI) parameters with FMS, BAQ and YBT was also evaluated in this study.

The mean FMS value was found to be 17.25±1.15 and the mean BAQ value was found to be 98.33±11.67 in this study. In addition, there was a moderate positive correlation between FMS and BAQ scores (r=0.671; p<0.001). Chorba et al. (2010) stated that a FMS score of 14 and below is associated with 69% of injury and the risk of experiencing injury is four times higher in their study (Chorba et al., 2010). It was determined that a FMS score of 14 or below is associated with serious injuries in another study involving professional American football players (Kiesel et al., 2007). The FMS test was applied to the athletes and their non-impact injuries were followed up in another study in which 160 athletes from various sports branches (swimming, rugby and football) participated. According to the results of the study, it was stated that the probability of having an injury is twice as high for athletes with an FMS test score of 14 and below compared to other athletes (Garrison et al., 2015). The literature review shows that individuals with high Functional Movement Screen (FMS) scores face fewer injuries during the season (Chorba et al., 2010, Kiesel et al., 2007, Garrison et al., 2015). In this study, the fact that the FMS scores of the athletes have a mean of 17.25±1.15 between 15-19 shows that the probability of injury risk will be low. Evaluation of the questionnaire in the BAQ is based on the total score. It is reported that the higher scores (min. 18–max. 126) given by the participants for each statement (from 1 to 7) of 18 questions indicate better body sensitivity (Shields et al., 1989). It can be interpreted that the participants in our study had good body sensitivity with an average of 98.33 BAQ scores.

It was stated that individuals with high levels of training had better movement quality, trunk stabilization and postural stability than healthy normal individuals in a study examining the relationship between FMS score and trunk muscle strength, body composition and balance. It has also been stated that FMS can be used to interpret trunk stabilization and postural stability in the absence of isokinetic systems and balance assessment devices (Zorlular et al.,2017).

Zorlular et al. (2017) stated in their studies on active athletes and healthy subjects that FMS score, trunk muscle strength and balance values decreased against healthy control subjects, total body fat percentage increased against healthy controls, there was a significant relationship between FMS total score and some trunk muscle strength tests, there was also a relationship between total body fat percentage and FMS total score (Zorlular et al., 2017).

It has been stated that in individuals with an average age of 21.1, they found the FMS score of 16.6, the balance CR score of 96.4, and the balance CL score of 96.4, and as a result, there was a moderate relationship between FMS and YBT scores in a study investigating the relationship between FMS and YBT (Koçak and Ünver 2019). It has been stated that they could not find a statistically significant relationship in another study examining the relationship between FMS total scores and YBT composite scores in high school male athletes (Smith et al.,2017). Similarly, Rusling et al (2015) have stated that there was no relationship between the FMS total score and the balance composite score and the injuries experienced, but in the same study, there was a relationship between the FMS score of deep squats and trunk stability (push-ups) movements and the number of injuries in their study on young football players. According to the study, they stated that young football players with low scores for deep squats or trunk stability (push-ups) were injured more frequently (Rusling, et al.,2015). In the literature, there are studies stating that there is a relationship between FMS and YBT (Smith et al.,2017; Rusling, et al.,2015), with studies stating that there is no relationship (Kelleher etal., 2017).

Kelleher et al. (2017) reported that they observed weak correlations between FMS score and PL, PM and Total balance (r=0.36, 0.37 and 0.36, all $p < 0.05$, respectively) in 78 healthy subjects aged 18-55 years whose physical activity levels were not specified. In addition, they stated that they could not find a correlation between the FMS score and normalized anterior (A) balance (r=0.22; p=0.053), and they reported that they thought that the dynamic postural control evaluated by YCT partially represented FMS (Kelleher et al., 2017). In this study, it can be said that the relationship between FMS and SCT is similar to the literature since there is a relationship in other balance parameters except anterior right (AR) and left (AL) balance values.

Considering the relationship between YBT and BAQ scores in our study, Participants whose dominant legs were right legs were found to have a moderately positive relationship in all parameters (AR (r=0.421 p<.040)), PMR (r=.469 p<.021), PLR (r=.409 p<.047) and CR (r=.576 p<.004) of the right dynamic balance. It is stated that motor experience constitutes structural and functional adaptations of postural function (Paillard, T. (2017), however, postural adaptations associated with regularly repeated motor tasks are specific to the context in which they are performed (Paillard, T. (2014). It is also stated that certain motor tasks, including certain postures and environmental conditions, develop certain postural skills (Paillard, 2014). For this reason, postural adaptations are specific to motor experience. It can also be questioned whether there is any difference in terms of postural balance between the two legs, as they usually perform different motor tasks (Paillard and Noé 2020). In the light of the information given in the literature, it is thought that there is a relationship between all parameters of the right dynamic balance and body awareness, since the dominating legs of the participants are their right legs.

It is the duty of the proprioceptive sense to increase body awareness and manage motor skills with motor control (Seth, 2013). The proprioceptive sense, as an integral part of the vestibular system, is related to the ability to perceive the position of the body in space and transmit the sense of position, to respond to the sense of position, to react to stimuli that will perform static and dynamic postures and functional movements. It is also a concept that encompasses the integrity of the senses of touch, vision and hearing, as well as perception, reaction and cognitive structures. Piek et al. (2007) emphasized that there are many methods that provide the development of body awareness, including sports activities, in-water exercises, massage, proprioceptive sensory training, yoga, mirror therapy and meditation techniques (Piek et al., 2007).

Frost et al. (2012) stated that before and after the 12-week training in which 60 firefighters voluntarily participated, verbal feedback was avoided because the kinetics and kinematics of FMS movements would change, and they evaluated according to how they chose to perform rather than how they could perform in their study in which they used Functional Movement Screen to evaluate the effectiveness of the training. They stated that the trained firefighters chose to squat above the parallel as they were aware that they would not be able to provide sufficient control over their trunk or hips in the deep squat FMS movement. They stated that they thought that their decision to act in this way might be due to the improved body awareness gained during the intervention. In addition, they stated that the observed movement pattern may indicate that the person lacks the necessary awareness or physical skills if they did not select or build up the muscle strength and stiffness necessary to maintain a neutral low back stance during trunk stability push-ups with FMS movement (Frost et al., 2012). In the literature review, no specific study was found which examined the relationship between FMS and BQA. However, in the study of Frost et al. (Frost et al., 2012), they stated that when there is no correction while performing FMS movements, there may be changes in movements with the awareness of lived experiences. The fact that the relationship between FMS and BAQ was found in this study can be interpreted as the fact that active athletes are aware of their experiences in sports life, and in parallel, FMS scores will increase as their body awareness increases.

In our study, when the age parameter of the participants was examined, it was seen that there was a moderate positive correlation between age and BAQ ($r=.630$ $p<.001$) and FMS ($r=.670$ $p<.001$). It is thought that body awareness and postural stability may have increased positively with age in these age groups in active athletes. In addition, it was determined that the age parameter was correlated with the balance parameters PMR ($r=.416$ $p<.043$), reach distance and CR score ($r=.470$ $p<.020$), which were performed on the right foot. In the light of the information given in the literature above, it is thought that the relationship between age and PMR and CR may be due to the dominant right leg of the athletes.

Statistical analysis of the height parameter revealed a positive correlation between height and body weight ($r=.534$ $p<.007$). In the literature, it has been emphasized that there is a strong positive relationship between height and body weight (Almuzaini, (2007). In addition, it has been stated that height and body weight are positively related to vertical jump, and height may have an indirect effect on strength and power since tall people have higher body weights (Almuzaini, 2007). The relationship between height and body weight in this study is similar to the literature. There is also a weak negative correlation between height and CL ($r= -.429$ $p<.037$) score, which is one of the dynamic balance parameters in our study. It has been investigated the relationship between height, body weight, bone dimensions of the lower extremities and circumference measurements, BMI and waist-hip ratio measurements (anthropometric ratio indexes) and static balance of university students doing sports. In a study conducted in the literature, the relationship between height, body weight, bone dimensions of lower extremities and circumference measurements, BMI and waist-hip ratio measurements (anthropometric ratio indexes) of students doing sports at the university with static balance was examined. As a result, they stated that they found a decreasing (negative) relationship at the $r=0.164$ level between the fixed balance of the dominant feet and the length of the lower part of the leg (Moein and Movaseghi, 2016). Body weight and height are related to each other (Almuzaini, 2007), and at the same time, with the increase in leg length depending on the height, the relationship with the left composite values of the dynamic balance with the jumping foot, which is dominant, can be explained. Moein and Movaseghi (2016) support the relationship between height and left composite score found in our study in their research.

When the correlation levels of the BMI parameter were examined in our study, it has seen that there was a moderate positive correlation between BMI and BAQ (r=.477 p<.018) and body weight (r=.534 p<.007). In a study investigating the effect of BAQ on age and body attitudes in overweight women, they stated that BAQ did not significantly change with age, BMI was independent of age, obese subjects felt significantly less attractive than those with a BMI slightly above the average, and did not humiliate their bodies more than women with less weight and as a result, they reported that the BAQ appears to be significantly independent of the existing physical body (Ben-Tovim 1991). They stated that they found a negative correlation between BMI, body weight, body fat percentage, waist and neck and middle-upper arm circumference measurements at p<.05 level of body awareness (BAQ) score, and BAQ explained 22.9% of BMI in the study examining the relationship between body awareness, body mass index and lipid profiles in adolescents (average age of 13.3) (Açık and Çağıran 2022). In this study we have done, our findings (positive significant relationship) contradicts Açık and Çağıran (2022)'s research (negative relationship). We think that this discrepancy is due to the characteristics of the study groups in both studies. In our study, we studied active athletes with an average age of 18, while the aforementioned research was conducted on adolescents with an average age of 13.3 hospitalized in a private nutrition and counseling clinic.

In the literature, it has been stated that there are relations between FMS and YBT, albeit partially. However, no study was found between body awareness and other FMS and YDS. The FMS evaluation is a test usually evaluated by physical therapists. From this point of view, it is thought that controlling the balance parameters with the score obtained from the BAQ can provide information about the injury risks of the athletes. However, studies with larger sample groups are needed.

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CONFLICT OF INTEREST

None.

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