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COMPARISON AND DETERMINATION OF THE BALANCE SKILLS OF FOOTBALL PLAYERS THROUGH DYNAMIC POSTUROGRAPHY WITH SOME SELECTED PARAMETERS

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Abstract:
The purpose of this study is: comparison and determination of the balance skills of football players through dynamic posturography with some selected parameters. The experimental group of the research is composed of super amateur level football players who have at least 4 years of sports experience and study at Istanbul Gelişim University, School of Physical Education and Sports (N=90). The sample, which was determined through convenience sampling method, is composed of voluntary participants (n=30). Data form (sport year, position, dominant foot preference) was applied as the data collection tool. Balance measurements were performed by a specialist physician from the Istanbul University Cerrahpaşa Faculty of Medicine Department of Audiology through a dynamic posturography. Six gradual sensorial organization tests were applied to the participant. Every step was repeated three times, the steps were applied from simple to difficult (eyes open and platform static) (eyes closed platform and cabin moving). With respect to how to read test result the data from the participants were compared to the maximum theoretical limit. The results were evaluated in a range of 0-100. According to the result, obtained 100 points constitute perfectness. T test and Anova analysis were applied as the statistical process. As a result, a significant difference was found in auditory, prefer and composite equilibrium parameters according to the foot preferences of footballers. Significant differences were also found in the balance skill scores of goalkeepers and defense players. It has been determined that goalkeeper's visual balance skills are better. In the literature survey, dynamic posturography and sensory organizational testing was not used as a measure of balance skills performed on athletes.

Keywords: balance, sensory organization test, dynamic posturography

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1. Introduction

High level balance ability plays significant role in showing better performance also in determining the balance level required by the sport branch and taking necessary precaution in advance by knowing that players who have insufficient balance parameters might be subjected to injuries. The fact that a football player controls the position of his teammates and his opponent at the same time and maintains the correct position according to the ball that is coming into him and the fact that the footballer is injured due to fatigue and loss of balance because of the stresses caused during exercise or competition have an impact for the expected performance which the football players are expected to perform.

Balance is a complex structure that requires activity of central nervous system and musculoskeletal system. For the knowledge, integrate the nervous system at various levels. Normal postural control requires integration of sensory and motor activity. Visual and vestibular system provides detailed information about the environment and transpires coordinated response through spinal stretching reflexes and long latency reflexes. (Overstall, P.W., Exton, Smith, A.N., Imms, F.J. ve Johnson, A.L. 1977), (Murray, M.P. Seireg, A.A. ve Sepic, S.B. 1975), (Brockehurst, J.C., Robertson, D. ve James-Groom, P. 1982).

Sensor organs involve vestibular, visual, proprioceptive autonomous and hearing-related systems. These systems carry sensory information to many levels of the nervous system. This information is coordinated at many levels of the central nervous system. (Konrad, H.R., Girardi, M. ve Helfert, R., 1999)

Computerized dynamic posturography is a method of evaluating an individual's standing balance using different test positions arranged in a similar way to situations that may be encountered in daily life (Nashner, L.M., 1997). It also evaluates the individual's ability to use information from visual, vestibular and somatosensory systems and the ability to coordinate information received from these systems (Üneri, A., 2005)

The information that are coming through somatosensory systems should be taken in order to maintain moving upright position or fixed position of the body. They should be used together and unnecessary information should not be used. In order to realize musculoskeletal system, vestibulo-acupuncture, vestibulo-spinal reflexes are necessary along with robust neurological system and musculoskeletal system, vestibulo-acupuncture, vestibulo-spinal reflexes, and attention, remembering, willing, and other functions. Individuals constantly makes very slight body swings forward, backward, right and left to maintain the balance. Postural oscillations are closely related to all sensory perceptions of the person at that moment and form the basis of posturographic measurements. (Üneri, A., 2005)

It is seen that the balance technique is mostly measured by field tests in the literature review. The advantage of SOT using dynamic posturography in a laboratory environment is that it allows each system to be examined separately providing the main

information to the postural control system. Balance measurements performed in the laboratory environment are expected to provide more reliable and valid results and contribute positively to the performance evaluation of the sport branch. The purpose of this study is; Comparison and determination of the balance skills of football players through dynamic posturography with some selected parameters.

2. Material method

The purpose of this study is; Comparison and determination of the balance skills of football players through dynamic posturography with some selected parameters. The experimental group of the research is composed of super amateur level football players who have at least 4 years of sports experience and study at Istanbul Gelişim University, school of Physical Education and Sports (N=90). The sample, which was determined through convenience sampling method, is composed of voluntary participants (n=30). (sport year, position, dominant foot preference) was applied as the data collection tool. Football players were given information about all the actions to be done before the test started. Balance measurements were performed by a specialist physician from the Istanbul University Cerrahpaşa Faculty of Medicine Department of Audiology through a dynamic posturography. In this study use, the Neurocom Smart Balance Master System posturography with six gradual sensorial organization test was applied to the participant. Football players were given information about all the actions to be done before the test started. The participants were dressed in a special vest for precaution and the risk of falling was lifted to safety. After the feet of the body were placed in position on the support surface with the force platform, it was tested for 20 seconds for each case.

1. Position: Eyes open and platform stable and no visual swing
2. Position: Eyes closed and platform stable and no visual swing
3. Position: Eyes open and platform stable and visual swing
4. Position: Eyes open, no visual swing, platform dynamic
5. Position: Eyes closed, no visual swing, platform dynamic
6. Position: Eyes open, visual swing, platform dynamic.

   The balance scores were recorded in SPSS 22 Package program.

2.1 Statistical Analysis

The personal information form (sport year, position, dominant foot preference) and sensory organization test results with dynamic posturography test ratio data were entered into the SPSS 22.0 package program and the analyses have been conducted through the package program. Factor scores of the personal information and measurements related to the candidates were evaluated by determining frequency (f) and percent (%) values. Parametric and nonparametric distribution curves and skewness-kurtosis values of the points are examined in deciding the conditions of

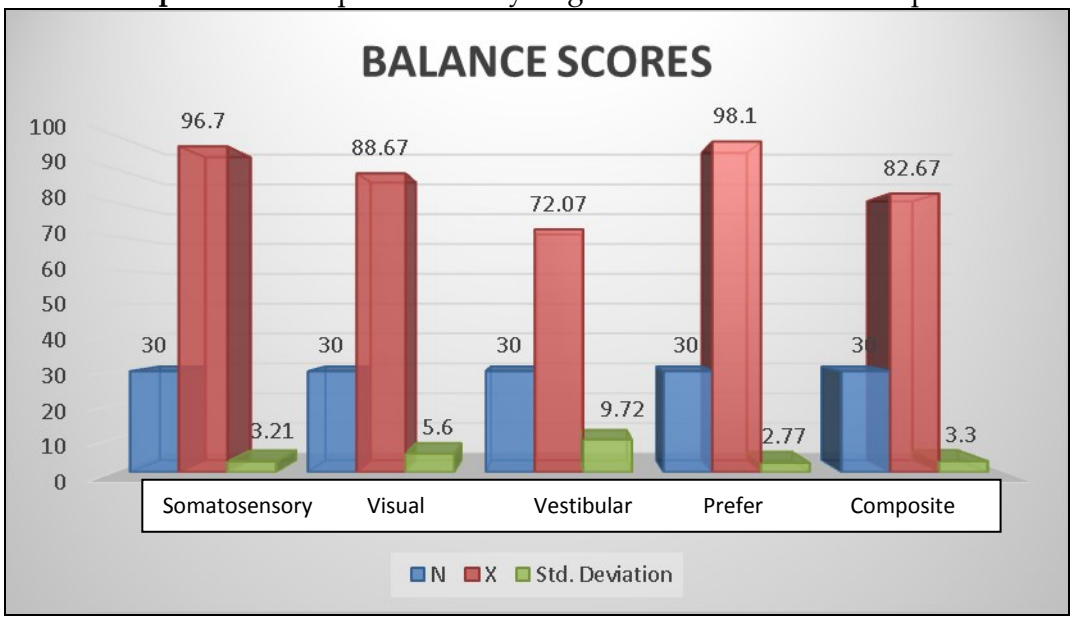
parametric and nonparametric distributions. The data show a parametric distribution. T test and Anova analysis were applied as the statistical process.

Table 1: Socio-Demographic Characteristics of the Participants

		Frequency	Percent
Sports Experience	6-10 years	14	46,7
	11-15	16	53,3
	Total	30	100,0
Foot Preference	Right Foot	20	66,7
	Left Foot	10	33,3
	Total	30	100,0
Position	Defensive Player	10	33,3
	Forward Player	14	46,7
	Goalkeeper	6	20,0
	Total	30	100,0

When Table 1 is examined, according to the socio-demographic characteristics of the participants, it is determined that 46,7% has sports experience of 6-10 years, 53,3% has sports experience of 11-15 years, 66,7% has a right foot, 33% has a left foot preference, 33,3% are defensive players, 46,7% is forward players, and 20% is goalkeepers.

Graphic 1: Participants' Sensory Organization Test Result Graphic



When examining Graphic 1 is determined that, 96,7±3,21 the average of the sensory balance skills ratio of the football player's, 88,67±5,6 the average of the visual balance skills, 72,07±9,72 the average of the vestibular balance skills, 98,1±2,77 the average of the pref balance skills and 82,67±3,3 the average of the composite balance skills.

4. Findings

Table 2: Descriptive Analysis of Balance Skills According To Left and Right Foot Preferences of Footballers

	Foot	N	X± Sd	t	p
Somatosensory	right	23	96,91± 2,83	,653	,519
	left	7	96,00±4,43		
Visual	right	23	88,61±5,86	-,110	,920
	left	7	88,86±5,05		
Vestibular	right	23	70,09±9,67	-2,145	**,041**
	left	7	78,57±7,00		
Prefer	right	23	98,04±2,77	-3,191	**,033**
	left	7	98,29±2,98		
Composite	right	23	81,91±2,94	-3,249	**,048**
	left	7	85,14±3,44		

When Table 1 is examined, it is determined that the average of the sensory balance skill ratios of football players who prefer right leg score 96,91± 2,83, the average of the sensory balance skill ratios of football players who prefer right leg score 96,00±4,43, the average of the visual balance skill ratios of football players who prefer right leg score 88,61±5,86, the average of the visual balance skill ratios of football players who prefer left leg score 88,86±5,05, the average of the vestibular balance skill ratios of football players who prefer right leg score 70,09±9,67, the average of the vestibular balance skill ratios of football players who prefer left leg score 78,57±7,00, the average of the prefer balance skill ratios of football players who prefer right leg score 98,04±2,77, the average of the prefer balance skill ratios of football players who prefer left leg score 98,29±2,98, the average of the composite balance skill ratios of football players who prefer right leg score 81,91±2,94, the average of the composite balance skill ratios of football players who prefer left leg score 85,14±3,44, as a result of statistical analysis, significant differences were found in visual, pref and composite balance parameters according to foot preferences.

Table 2: Evaluation of Balance Skills According to Sport Positions of Footballers

	Position	N	X± Sd	f	p	Tukey HSD
Somatosensory	Defensive Player[1]	9	97,00±3,64	,371	,774	-
	Midfield[2]	8	96,25±3,01			
	Forward Player[3]	7	97,57±2,76			
	Goalkeeper[4]	6	95,83±3,76			
Visual	Defensive Player[1]	9	86,11±3,79	2,875	**,044**	1-4
	Midfield[2]	8	89,13±5,36			
	Forward Player[3]	7	87,43±5,59			
	Goalkeeper[4]	6	93,33±6,38			
Vestibular	Defensive Player[1]	9	69,33±11,40			-
	Midfield[2]	8	75,50±10,54			
	Forward Player[3]	7	70,14±7,84			

	Goalkeeper[4]	6	73,83±8,30	,706	,557	
Prefer	Defensive Player[1]	9	99,11±2,32	1,742	,183	-
	Midfield[2]	8	99,00±1,77			
	Forward Player[3]	7	96,57±3,74			
	Goalkeeper[4]	6	97,17±2,71			
Composite	Defensive Player[1]	9	81,78±3,67	2,004	,138	-
	Midfield[2]	8	84,88±2,70			
	Forward Player[3]	7	81,29±2,14			
	Goalkeeper[4]	6	82,67±3,78			

When table 2 examined, it is observed that the average of the sensory balance skill ratios of the defensive players score 97,00±3,64, the average of the sensory balance skill ratios of the midfield players score 96,25±3,01, the average of the sensory balance skill ratios of the forward players score 97,57±2,76, the average of the sensory balance skill ratios of the goalkeepers score 95,83±3,76, the average of the visual balance skill ratios of the defensive players score 86,11±3,79, the average of the visual balance skill ratios of the midfield players score 89,13±5,36, the average of the visual balance skill ratios of the forward players score 87,43±5,59, the average of the visual balance skill ratios of the goalkeepers score 93,33±6,38, the average of the vestibular balance skill ratios of the defensive players score 69,33±11,40, the average of the vestibular balance skill ratios of the midfield players score 75,50±10,54, the average of the vestibular balance skill ratios of the forward players score 70,14±7,84, the average of the vestibular balance skill ratios of the goalkeepers score 73,83±8,30, the average of the prefer balance skill ratios of the defensive players score 99,11±2,32, the average of the prefer balance skill ratios of the midfield players score 99,00±1,77, the average of the prefer balance skill ratios of the forward players score 96,57±3,74, the average of the prefer balance skill ratios of the goalkeepers score 97,17±2,71, the average of the composite balance skill ratios of the defensive players score 81,78±3,67, the average of the composite balance skill ratios of the midfield players score 84,88±2,70, the average of the composite balance skill ratios of the forward players score 81,29±2,14, the average of the composite balance skill ratios of the goalkeepers score 82,67±3,78 it is observed that.

As a result of the statistical analysis, significant differences were found between balance scores of defenders and goalkeepers. Goalkeepers has visual balance skills is better.

5. Discussion

It is observed that the average of the sensory balance skill ratios of football players who prefer right leg score 96,91± 2,83, the average of the sensory balance skill ratios of football players who prefer right leg score 96,00±4,43, the average of the visual balance skill ratios of football players who prefer right leg score 88,61±5,86, the average of the visual balance skill ratios of football players who prefer left leg score 88,86±5,05, the average of the vestibular balance skill ratios of football players who prefer right leg score 70,09±9,67, the average of the vestibular balance skill ratios of football players

who prefer left leg score 78,57±7,00, the average of the prefer balance skill ratios of football players who prefer right leg score 98,04±2,77, the average of the prefer balance skill ratios of football players who prefer left leg score 98,29±2,98, the average of the composite balance skill ratios of football players who prefer right leg score 81,91±2,94, the average of the composite balance skill ratios of football players who prefer left leg score 85,14±3,44, as a result of statistical analysis, significant differences were found in visual, pref and composite balance parameters according to foot preferences. In the literature review, dynamic posturography and sensory organizational test were not used as a measure of equilibrium performance on sportsmen. Dynamic posturography has been used mostly in individuals with health problems and in rehabilitation oriented practices.

Müjdeci reported in a study of the relationship between falls and the balance of evangelical elderly individuals, individuals with a history of falling DOT composite values of the ratios 77,06±3,74, individuals who do not have a fall story DOT composite values of the ratios 81,66±3,37. It can be said that the individuals who are in danger of falling are caused by the good balance parameters with the DOT compound values in our study (Müjdeci B., 2009)

Demirkundak reported in a study of individuals living and no living in danger of falling, the DOT composite balance skills values of the ratios in individuals who are at risk of falling no living in danger 70,66±8,56, the individuals living in danger of falling 66,41±14,96 and the visual balance skills values of the ratios in individuals who are at risk of falling no living in danger 77,41±21,55, somatosensory balance skills 97,64±2,66, vestibular balance skills 54,76±21,55.2 (Demirkundak, B., 2016)

Somatosensory balance skill score of right-footed preferred footballers is 96.91 ± 2.83 left foot preferred football players are 96.00 ± 4,43 88,61 ± 5,86 for the visual balance skills score of the right foot preferred footballers, 88,86 ± 5,05 for the left foot preferred footballers, the audiovisual balance skill score of the right foot preferred football players is 70,09 ± 9,67, the left foot preferred football players are 78,57 ± 7,00 the pref balance skill score of the right foot preferred footballers is 98.04 ± 2.77, the left foot preferred footballers are 98.29 ± 2.98, the composite balance skill score of the right-footed preferred footballers is 81,91 ± 2,94, the left-footed footballers are 85,14 ± 3,44, As a result of statistical analysis, significant differences were found in auditory, pref and composite equilibrium parameters according to foot preferences. In the literature review, dynamic posturography and sensory organizational test were not used as a balance skill measurement method performed on athletes. Dynamic posturography has been used mostly in individuals with health problems and in rehabilitation oriented practices.

In a study of the balance of elderly individuals in relation to their falling state, 77.06 ± 3.74 of individuals with a history of falling DOT composite ratio, it is reported as DOT 81.66 ± 3.37 for individuals without a falling story. It can be argued that the individuals who are at risk of falling originate from the fact that the equilibrium parameters are close to the DOT compound ratio in our study (Müjdeci B., 2009)

In a study of the conducted by on individuals living and living at risk of falling, DOT reported 70,66 ± 8,56 in composite balance skill and 66,41 ± 14,96 in individuals at risk of falling in individuals who were at risk of falling. In addition, they found that the individuals who are in danger of falling have 77,41 ± 21,55 visual balance skills, 97,64 ± 2,66 sensory balance skills and 54,76 ± 21,55 vestibular balance skills (Demirkundak B., 2016)

The mean scores of the sensory balance skill score of the defense players were 97.00 ± 3.64, the average score of the sensory balance skill score of the midfield players was 96.25 ± 3.01, the sensory balance skill score of the forward players was 97.57 ± 2.76, 95.83 ± 3.76 of the score average, 86.11 ± 3.79 of the visual balance skill score of the defense players, 89.13 ± 5.36 of the average balance skill score of the midfield players, 87.83 ± 5.36 of the forward player's average of the visual balance skill score , 43 ± 5,59, 93,33 ± 6,38 of the visual balance skill score of the players, 69,33 ± 11,40 of the defensive player's averages of the vestibular balance skill score, 75,50 ± 10 of the averages of the vestibular skill score of the midfield players , 54, the averages of the vestibular balance skill score of the forward players were 70,14 ± 7,84, the average of the auditory balance skill score of the goalkeeper was 73,83 ± 8,30, the defense players' prefer balance skill sk the average of the prefer balance skill score of the midfield players was 99.00 ± 1.77, the score of the prefer balance skill score of the forward players was 96.57 ± 3.74, the average of the pref balance skill score of the goalkeeper was 97.17 ± 2.71, defensive player's composite balance score averaged 81.78 ± 3.67, midfield player's composite balance skill score averaged 84.88 ± 2.70, forward player's composite balance skill score averaged 81.29 ± 2.14, it is seen that the average score of the composite balance skill score is 82,67 ± 3,78. As a result of the statistical analysis, significant differences were found between balance scores of defenders and goalkeepers. In the literature review, dynamic posturography and sensory organizational test were not used as a balance skill measurement method performed on athletes. Dynamic posturography has been used mostly in individuals with health problems and in rehabilitation oriented practices.

Tuğba Kocaağca, In a study of the call it, Effect of Exercise-Induced Muscle Damage on balance Performance, experimental group's static platform single leg general balance score averaged 2,2457 ± 0,859, in the basal , 3,136 ± 1,382 after training, 2,245 ± 1,240 in 24 hours, 2,155 ± 1,214 in 48 hours, 72 2,273 ± 0,926, 2,227 ± 0,828 in the 96 hours, on experimental group in the static platform single leg general balance score averaged, 2,345 ± 0,924 in the basal, after training 2,127±1,2241, 1,973 ± 1,013 in the 24 hours, 2,409 ± 0,890 in the 48 hours, 2,355 ± 0,789 in the 72 hours, 2,100 ± 0,787 at 96 hours, experimental group's on static platform single leg anterior-posterior balance score averages 1,664 ± 0,993 at basal 1,664 ± 0,993, 1,845 ± 1,282 at 24 hours, 1,773 ± 1,166 at 48 hours, 1,800 ± 1,021 at 72 hours, 1,709 ± 0.844 in the 96 hours, the control group's on static platform single leg anterior-posterior of the balance score averages in basal 1,873 ± 1,054, 1,627 ± 0,700 after training, 1,418 ± 0,941 at 24 hours, 2,009 ± 0,897 in the 48 hours, 1,791 ± 0,838 at 72 hours, 1,491 ± 0,906 at 96 hours, experimental group on static platform single leg medial-lateral of the balance score averages 1,136 ± 0,785 at the

basal, 1,427 ± 0,859 after training, 1,064 ± 0,684 , 0,964 ± 0,668 at the 24 hours, 1,064 ± 0,608 at 72 hours, 1,109 ± 0,739 at 96 hours, the static platform medial-lateral balance score of the control group 0,909 ± 0,585 basal, 1,136 ± 1,168 after training, 1,064 ± 0,816 at 24 hours, 1,082 ± 0,699 at 48 hours, 1,209± ± 0.724 at 72 hours, 1,227 ± 0,531 at 96 hours, experimental group on dinamic platform single leg general balance score average 2,373 ± 0,690 at basal, 2,345 ± 0,940 after training, 2,027 ± 0,827 at 24 hours, 1,955 ± 0,822 at 48 hours, 1,973 ± 0,743 at 72 hours, 2,018 ± 0,643 at 96 hours , The control group's static platform single leg general balance score averaged 2,218 ± 0,392 basal, 2,145 ± 1,156 after training, 1,791 ± 0,904 at 24 hours, 1,855 ± 0,539 at 48 hours, 1,918 ± 0,551 at 72 hours, 1,936 ± 0,546 at the 96 hours, the static platform single leg anterior-posterior balance score of the experimental group 1,964 ± 0,731 basal, 1,882 ± 1,077 after training, 1,691 ± 0,993 at 24 hours, 1,555 ± 0,965 at 48 hours, 1,527 ± 0,860 at 72 hours, 1,655 ± 0,418 at 96 hours , The control group's static platform single leg anterior-posterior balance score average 1,836 ± 0,553 at basal, 1,736 ± 1,152 after training, 1,345 ± 0,872 at 24 hours, 1,473 ± 0,433 at 48 hours, 1,500 ± 0,632 at 72 hours, 1,191 ± 0,504 at 96 hours, experimental group static platform single leg medial-lateral balance score averaged 1,136 ± 0,671 basal, 1,064 ± 0,724 after training, 0,973 ± 0,477 at 24 hours, 0,918 ± 0,685 at 48 hours, 0,982 ± 0,627 at 72 hours, 1,027 ± 0,757 at 96 hours, control group static platform single leg medial-lateral balance score averaged 1,009 ± 0,434 basal, 0,973 ± 0,910 after training, 1,009 ± 0,665 at 24 hours, 0,982 ± 0,619 at 48 hours, 0,973 ± 0,508 at 72 hours, 1,345 ± 0,502 was determined (Tuğba K., 2014) In the literature review, dynamic posturography and sensory organizational test were not used as a balance skill measurement method performed on athletes. Dynamic posturography has been used mostly in individuals with health problems and in rehabilitation oriented practices.

6. Conclusion

As a result of the statistical analyzes made, significant differences were found in auditory, pref and composite equilibrium parameters according to foot preferences. Variable dominant foot preferences of the athletes are thought to be effective when the balance skill scores are also different. It is considered that undertaking the role of support for the non-dominant lap during the implementation of sportive performance will show more improvement than the predominant lap of the lap.

Nurtekin Erkmen, in his famous study on the comparison of the balance performances of athletes, determined the difference in the static and dynamic balance performances of the football players after exercising according to the pre-exercise. The dominant static equilibrium performance decreased with the effect of exercise, but the dynamic equilibrium performance increased (Nurtekin E., 2006)

As a result of the statistical analyzes made, significant differences were found between balance scores of players and defenders. Goalkeepers seem to have better visual balance skills. Professional football players are expected to have different visual equilibrium skill ratios for postural control according to their position. For example,

different postural control systems should be developed in variable situations, such as constantly monitoring or checking the ball.

In the study by Paillard and Noe, the postural control performance of amateur and professional football players was investigated and as a result; Football; The obligation to control the ball with the feet, which brought a strong visual addiction about the ball, the opponent and his teammates, indicated that the footballers had to look towards the place, contradictory to the obligation to monitor the displacement of other players. This has led to the development of high-level football players' ability to turn their gaze from one to the other in order to increase the time to watch the match. (Paillard, T.H., Noe, F., 2005)

Balance Team Sports is important in terms of determining the skills that must be developed according to the players' positions and there is a common opinion that the athletes are also sensitive and effective to make a difference according to the branches. In addition, it is suggested that balance performance is associated with neuromuscular control during movement, and balance and neuromuscular training should be used as an important preparation program at all stages of long-term athletic development, especially early periods. Balance training has been reported to be very effective in terms of prevention of disability and neuromuscular and functional performance. Moreover, it is known that balance exercises and rehabilitation have a critical prescription to return to the spore after such injuries.

Conducted studies to determine balance skills in sports show that field tests have been used to prevent possible sports injuries, determine rehabilitation program after injury, and improve sporting performance.

For top football players, perfect postural balances are required for optimum performance during competition and training. It is thought that the majority of elite athletes should have improved visual, auditory and sensory balance skills. Various equilibrium measurement methods are used to quantitatively evaluate both static and dynamic equilibrium. Dynamic posturography is one of the accepted methods used worldwide to measure balance.

As a result, more objective tests using modern technology, a series of evaluation protocols based on kinematic and kinetic data for equilibrium measurement, especially in the laboratory environment, including balance evaluations in static and dynamic conditions, are firstly considered to be effective methods to achieve success in sports. It is considered that the widespread use of these methods in determining equilibrium skill ratios will help to achieve flawless performance in sports.

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