Original Article

Correlation between dynamic balance and flexibility among young athletes

Sana Naqi, Muhammad Asif, Muhammad Atif Khan, Muhammad Riaz Baig Chughtai, Saher Pasha, Kiran Arshad

Department of Rehabilitation Sciences, Isra University Karachi, and Liaquat University, Pakistan

Objective: To explore the correlation between dynamic balance and flexibility among young athletes in different sports club of Karachi, Pakistan.

Methodology: An observational study with 100 sample size was done. Data were collected from different sports club of Karachi. SPSS 23 was used to analyze data. Descriptive and inferential statistics were used to calculate Mean and t-test. Spearman correlation was used to analyze the correlation of different variables respectively.

Results: Association was found in left and right side of posterolateral and posteromedial reach directions while no association was found in anterior reach direction when correlated with 41 to 50 and 51-60 age groups. Male participant's scores higher in posterolateral, posteromedial and anterior reach direction than females.

Conclusion: The study concluded that balance had no influence on flexibly among young athletes. Furthermore short term participation in sports activity hadn't positive effect on balance and flexibility. (Rawal Med J 202;45:686-689).

Keywords: Flexibility, dynamic balance, athletes.

INTRODUCTION

Balance is the capability to maintain the body's center of mass within the base of support.[1] Balancing works with vestibular system and human balancing system is a complex system which creates a challenge in diagnosing the cause of unbalancing. Vestibular system is found out to be one of the causes of unbalancing.[2] The athletes appear to attain functional joint stabilization by relying on some form of pre-activated muscle tension in expectation of estimated joint load, whereby priory experienced muscle activation patterns and joint movements preprogram or "feed-forward" muscle activity.[3] Standing on, jumping to, or landing on one or both legs can be used commonly to evaluate the balance. Physical activity is refers as any bodily movement produced by muscles that need energy expenditure. WHO recommends 150 minutes of moderate, or at least 75 minutes of vigorous exercise per week.[4]

Physically active lifestyle has significantly long-term health benefits. Evidence showed that individuals associated with physical activity have low risk of injury. Injuries not only develop an emotional and fiscal burden on individual and their families but also reduce the level of physical activity in future.[5] Evidence showed that inactivity is significantly associated with high possibility of increasing imbalance. Reduction in physical activity leads reduction in reaction time. Flexibility is one of the components of health related fitness. Flexibility permits joints to move through full ROM. Sit and reach test is a common and reliable test to measure flexibility.[6] For measure flexibility, Sit-and-Reach test is used in many studies which focuses on rehabilitation. Flexibility test is also used in clinical setting to envisage risk of injury. Poor flexibility is also related with increased the risk of lower back injuries.[7]

The Sit-and-Reach test is usually used to evaluate the flexibility of low back muscles and thigh muscles. Although this test is mostly used in several fitness batteries, but still some authors suggest the several features are responsible for sit and reach scores which includes imbalance between the limbs relative to the trunk; scapular abduction, which affects the reaching distances and Sit-and-Reach scores that do not differentiate the contributions of the low back or hamstring muscles during the test. However previous researches reported low

association between Sit-and-Reach Test and low back flexibility.[8] A study was conducted to create the assess dynamic balance test and Isometric muscle strength in school going students. Results revealed that right leg had longer distance and stronger knee flexion while stronger knee extension was recorded in the posteromedial reach direction. Study concluded that the knee flexion and extension of dominant leg had found meaningfully associated with dynamic balance[9]. Thus this research aims to explore that through improving balance and flexibility athletes can enhance their athletic performance[10].

METHODOLOGY

The present study is a cross-sectional observational study. Participants were recruited from different sports of Karachi. A total 100 young athletes were chosen through purposive convenient sampling technique. Confidentiality of the participants was maintained. Consent was taken from all athletes for the use of data for research and publication. Both male and female participants were included who were involved in sports activity from last 12 months with age of 18– 40 years. The participants with joint pain in lower limb, history of trauma, vertigo, postural hypotension and taking medication such as sedatives, hypnotics and antidepressants were excluded from the study.

Participant's height, weight and leg length was measured. Participants were trained for dynamic balance and recruited for the study after obtaining informed consent. Their dynamic balances were measured by (SEBT- Star Excursion Balance Test)/ Y-balance test and their flexibility was measured by sit and reach test. Maximum reach distance (%maxd) was calculated by using the following formula: (Excursion distance / limb length) × 100 = % maxd.

For analysis, the maximum reading of each direction was employed. Next Y-balance was used to assess the balance of the participants. The person's limb length was determined by measuring the leg length. The participants lie on a table in supine position after removing shoes. Start with bent both knees with feet flat on the surface. Next, participant was asked to raise the hips off the surface and return to the resting position with knees fully extend. The legs at the malleoli are pulled on to ensure legs are fully extended.

On the person's right limb, first the most inferior distal surface of the ASIS is palpated and aligns it with the "0" zero line of a measuring tape then tape was extended to the inferior distal surface of the medial malleolus of the right ankle. Nearest 0.5 cm measurement was recorded. Three trails were taken of each leg in three directions (anterior, posteromedial or postero-lateral), and then return to the starting position. The maximal reach distance was measured at the edge of the reach indicator. After given the testing procedure instructions and practice trial we asked the participants to sit on the floor with both feet straight out and press their feet against the box. Then press down their knees to the floor and palms are facing downwards. Having them reach as far as they can towards their toes over the box and with the help of ruler recorded the length of reach. We took three measurements for each participant.

Statistical analysis: Data were analyzed by using the SPSS version 23. Coefficient correlation test was applied. Independent t-test and correlation was used for analysis.

RESULTS

Out of 100 participants, 51 (51%) were male while 49 (49%) were female. Mean and SD of body mass index was 21.2623 ± 4.15006. Spearman's rho correlation between sit and reach test and left posteromedial reach (cm) is .091 with sig. value of .365. Spearman's rho correlation between sit and reach test and left posterolateral reach (cm) was .085 with sig. value of .403.

Spearman's rho correlation between sit and reach test and left anterior reach (cm) is .122 with sig. value of .226. Spearman's rho correlation between sit and reach test and right posteromedial reach (cm) was .107 with sig. value of .288. Spearman's rho correlation between sit and reach test and right posterolateral reach (cm) was .096 with sig. value of .340. Spearman's rho correlation between sit and reach test and right anterior reach (cm) was .141 with sig. value of .161

Table 1. Spearman's rho correlation between Sit and Reach test.

	Spearman's rho	Sit and reach test scores
Left posteromedial reach (cm)	Correlation Coefficient	.091
	Sig. (2-tailed)	.365
	N	100
Left posterolateral reach (cm)	Correlation Coefficient	.085
	Sig. (2-tailed)	.403
	N	100
Left anterior reach (cm)	Correlation Coefficient	.122
	Sig. (2-tailed)	.226
	N	100
Right posteromedial reach (cm)	Correlation Coefficient	.107
	Sig. (2-tailed)	.288
	N	100
Right posterolateral reach (cm)	Correlation Coefficient	.096
	Sig. (2-tailed)	.340
	N	100
Right anterior reach (cm)	Correlation Coefficient	.141
	Sig. (2-tailed)	.161
	N	100

Fig. Sit and reach test scores (cm).

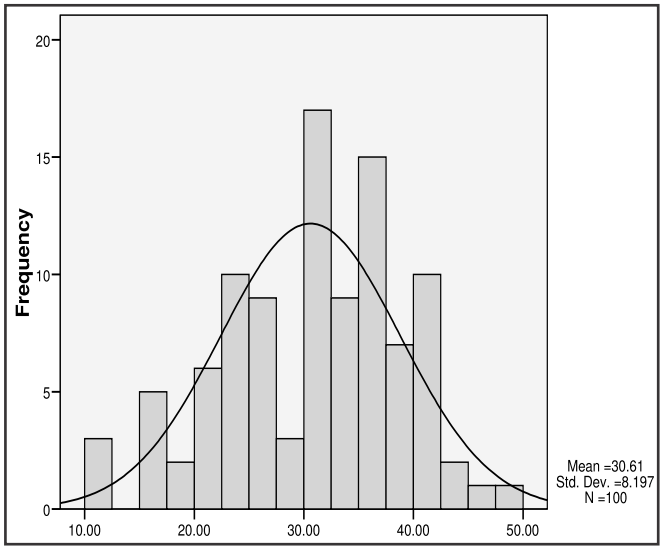

Table 2. Independent T test between sit and reach test and gender.

	Gender	Number	Mean	Std. deviation	t-value	sig-value
Sit and Reach test scores	Male	51	30.8431	8.77866	.289	.370
	Female	49	30.3673	7.62792	.290	

Table 3. Independent T test between y-balance test and gender.

	Gender	Number	Mean	Std. deviation	t-value	Sig-value
Right anterior reach (cm)	Male	51	75.3751	25.00444	3.560	.001
	Female	49	62.1569	7.20774	3.622	
Right posterolateral reach (cm)	Male	51	111.3166	30.99410	4.809	.000
	Female	49	87.6933	15.18743	4.869	
Right posteromedial reach (cm)	Male	51	115.8525	34.34713	4.202	.000
	Female	49	93.9053	12.76593	4.267	
Left anterior reach (cm)	Male	51	82.4994	35.55893	2.793	.006
	Female	49	67.8417	9.41022	2.842	
Left posterolateral reach (cm)	Male	51	117.9919	33.59995	4.991	.000
	Female	49	92.1043	14.01936	5.063	
Left posteromedial reach (cm)	Male	51	115.9672	32.49874	4.605	.000
	Female	49	92.8643	13.56699	4.671	

Results of present study showed no association in between y-balance reaches and balance test in all three positions (posteromedial direction, posterolateral direction and anterior reach direction). Furthermore study also found no correlation between flexibility and gender. While study found association in between y-balance reaches and gender.

DISCUSSION

Study found that females had better hip and knee abduction while they perform lower quarter y-balance test as compare to SEBT[11] Volschenk A reported in their research that dynamic balance had a positive association with all functional fitness and physical activity index in females, while when the male gender was studied, it has association only with their agility. Poor y-balance test scores were found in both male and female. Furthermore we found decreased level of balance among individual with ID.[12] Study reported significant difference in posteromedial reach and posterolateral reach while no meaningful difference was found in the anterior

reach distance among young adults.[13] Lower body y-balance test had no association with increased risk of injuries during physical training.

The upper body y-balance were found associated with high risk of injuries and movement screen with anterior reach direction of y-balance test.[14] Association was found in left and right side of posterolateral and posteromedial reach directions while no association was found in anterior reach direction when correlated with 41 to 50 and 51-60 age groups. Furthermore our study reported that balance decreases with aging.[15] Study reported higher y-balance scores in all directions in male participants as compared to female participants. Male participant's scores higher in posterolateral, posteromedial and anterior reach direction than females[16].

CONCLUSION

Flexibility is not associated with balance among young athletes. Dynamic balance wasn't increased with increasing level of flexibility among young athletes. Furthermore our study found positive association between balance and gender while no association found in flexibility with gender.

Author Contributions:
Conception and design: Sana Naqi
Collection and assembly of data: Sana Naqi
Analysis and interpretation of the data: Muhammad Asif
Drafting of the article: Muhammad Atif
Critical revision of the article for important intellectual content: Riaz Baig
Statistical expertise: Kiran Arshad
Final approval and guarantor of the article: Saher Pasha
Corresponding author email: Kiran Arshad: kiraniirs@gmail.com
Conflict of Interest: None declared
Rec. Date: Feb 16, 2020 Revision Rec. Date: April 29, 2020 Accept Date: Jun 16, 2020

REFERENCES

1. Helen Conyers, Simon Webster, Understanding and improving your posture ISBN 1-904156-27-4.
2. Fernandez-de-las-Penas C, Alonso-Blanco C, Cuadrado M, Gerwin R, Pareja J. Myofascial Trigger Points and Their Relationship to Headache Clinical Parameters in Chronic Tension-Type Headache. Headache: J Head Face Pain. 2006;46(8):1264-1272.
3. Armijo-Olivo S, Jara X, Castillo N, Alfonso L, Schilling A, Valenzuela E et al. A comparison of the head and cervical posture between the self-balanced position and the Frankfurt method. J. Oral Rehabil. 2006;33(3):194-201.
4. Molyneux J, Herrington L, Jones R. An investigation into the effect of a lower limb exercise programme on kinesiophobia in individuals with knee osteoarthritis. Osteoarthr. Cartil.. 2017;25:S407.
5. Alikhajeh Y, Hosseini S, Moghaddam A. Effects of Hydrotherapy in Static and Dynamic Balance Among Elderly Men. Procedia Soc Behav Sci. 2012;46:2220-4.
6. Shegofteh F, Ravesh NN, Anbohie SZ, Ziba MN, Farahani,B, Effect of physical activity on static and dynamic balance among the elderly Pharmacophore; 2017;8(6S), e-1173463.
7. Engagedscholarship.csuohio.edu. 2020 [cited 23 May 2020]. Available from: https://engagedscholarship.csuohio.edu/cgi/viewcontent.cgi?article=1719&context=etdarchive.
8. Kawano MM., Ambar G., Oliveira BIR., Boer MC., Cardoso APRG, Cardoso JR., Influence of the gastrocnemius muscle on the sit-and-reach test assessed by angular kinematic analysis; Rev Bras Fisioter, São Carlos. 2010;14(1)10-5.
9. Zhang B., Li S., Zhang Y., Evaluation of Dynamic Posture Control when Wearing High-Heeled Shoes Using Star Excursion Balance Test. J Phys Act Health 2017;1(1):1-7.
10. Rashidlamir A, Saadatnia A. The effect of eight weeks of aerobic training on the plasma level of adiponectin, leptin, and resistin in healthy middle-aged men. J. Sports Sci. 2012;27(6):351-356.
11. Alim M. Biomechanics of the Lower Extremity Dynamic Balance Tests: Kinematics and Electromyography Analysis of the Y-Balance Test and the Star Excursion Balance Test [Internet]. Semanticscholar.org. 2020 [cited 23 May 2020]. Available from: https://www.semanticscholar.org/paper/Biomechanics-of-the-Lower-Extremity-Dynamic-Balance-Alim/300e1fec60ea4afb9dc5858dc762f6e66302bfd8.
12. Mikołajczyk E, Jankowicz-Szymańska A. Dual-task functional exercises as an effective way to improve dynamic balance in persons with intellectual disability – continuation of the project. Medical Studies. 2017;2:102-9.
13. Reghabi S, Power L, An K, Ko J. Comparison between the Modified Star Excursion Balance Test and the Traditional Star Excursion Balance Test in Recreational Athletes. Asian J Kinesiol. 2018;20(3):19-23.
14. Kelleher L, Frayne R, Beach T, Higgs J, Johnson A, Dickey J. Relationships between the Functional Movement Screen Score and Y-Balance Test Reach Distances. Int J Hum Mov Sci. 2017;5(3):51-6.
15. Jain R, Gupta G, Sharma P, Kumar P. The Assessment of Renal Function Test in Perimenopausal Middle Aged Women with Hypothyroidism. Int J Curr Microbiol Appl Sci. 2018;7(07):2641-5.
16. Alnahdi A, Alderaa A, Aldali A, Alsobayel H. Reference values for the Y Balance Test and the lower extremity functional scale in young healthy adults. J. Phys. Ther. 2015;27(12):3917-1.