ORIGINAL ARTICLE

Comparison of Physical Performance Measures of Flexibility, Strength and Balance of School Students with University Students

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ABSTRACT

Aim: To find out variation in flexibility, strength and balance of university and school students on their dominant and non-dominant sides.

Study design: A Cross section study.

Place and duration of study: Data was collected from Lahore Grammar School (LGS), Al'Ala school and University of Management and Technology (UMT), Lahore. After approval of synopsis (RE-092-2021) the data collection was done from the duration of 10th November 2021 to 15th February 2022.

Methodology: A cross section study conducted on healthy school and university students. The data was collected by non-probability convenient sampling. After verbal Informed consent the data was obtained from school students of grade 7-10 from Lahore Grammar school and Al'Ala international Islamic school and undergraduate's students of UMT by using convenient sampling. Physical performance tests for measuring strength (sit-ups), flexibility (Zipper, sit and reach, dorsiflexion) and balance (Flamingo test) were demonstrated and were asked to perform. Readings were taken of each test.

Results: Sit ups excellent results were reported in majority of university students (36%). Sit and reach test was found better in university (32%), zipper test positive results were better in school students. Dorsiflexion test normal values were more in university (18%). Flamingo test showed 45% university students had good balance. There was statistically significant difference in zipper (P=0.004), flamingo (P=0.036) on non-dominant side and sit and reach dominant (P=0.006) and non-dominant side.

Practical implication: The normative data of physical performance measures can help prevent injuries, as these can be used as a reference to detect poor health and lethargy at school and university level. These measures can be used as a reference for primary prevention among university going and school going students.

Conclusion: Both groups showed good physical performance measures. Flexibility test showed better results in School students. Strength test showed better result in university students whereas, balance test reported better in school students.

Keywords: Balance, Flexibility, Limb dominance, musculoskeletal injuries, Physical activity, Strength,

INTRODUCTION

Physical fitness (PF), as an important health marker, affects the physical and mental health in the early and later life[1]. The improvement of fitness such as muscular strength, flexibility, balance is shown to be able to reduce the high rates of injuries related to musculoskeletal system. The strategies that are used to prevent injuries include those exercises that target strength, balance and flexibility and there is marked depletion in injuries if we are adhered to them and are performed properly[2].

Physically active people have a better body composition and have fewer health issues. Participation in sports and physical activities during children has long been recognized as beneficial to overall public health[3].

Notwithstanding of age physical activity has numerous benefits counting those prevention against injuries and infections. It too permits change of musculoskeletal condition, muscle quality and strength decreasing the hazard of heart diseases and carcinogenic changes improving psychophysical condition[4].

According to the principle of training specificity flexibility training enhances muscle flexibility whereas strength training develops muscular strength[5]. Insufficient flexibility and strength will have devastating effects on body and will cause muscle tiredness which will lead to incapacity of muscle to protect them from serious damage. Balance is a necessary motor capacity to achieve many motor skills. The children and adult having good static and dynamic balance can perform well in sports activities also in activities of daily living. Any failure between motor and balance skills increases the risk of falling hazard and physical injury even for healthy children during participations in sports activities[6].

Muscle strength testing is an important aspect of the physical examination procedure. In order to evaluate the impairments impeding the daily functional tasks of children it is essential to assess their strength accurately[7].

Flexibility is also defined as ability to move a body segment. Individuals with flexibility have been praised for their ability to successfully accomplish daily activities. Previous research has linked decreased flexibility and mobility to a higher chance of falling, as well as difficulty executing and maintaining motor activities. Soft-tissue degeneration may develop, which may reduce neuromuscular function[8].

Having good balance is important for daily life activities and plays an important role in preventing falls. A good balancing system provides you with greater energy and strength, as well as allowing you to move more confidently and freely[9].

The purpose of the study is to evaluate physical performance measures (flexibility, strength and balance). These normative values can be used to prevent injuries, as these can be used as a reference to detect poor health and lethargy at school and university level. These measures can be used as a reference for primary prevention among university going and school going students.

METHODOLOGY

A cross section study conducted on healthy school and university students. The data was collected by non-probability convenient sampling. Data was collected from Lahore grammar school (LGS), Al'Ala international Islamic school and university of management and technology (UMT), Lahore. After approval of synopsis (RE-092-2021) the data collection was done from the duration of 10th November 2021 to 15th February 2022.

Sample Size & Sampling technique: Sample size was calculated by formula $X = Z\ 2* p\ (1-p)/e^{2.}$ To calculate a proportion with a 95% level of confidence and a margin of error of 5% we obtained 100 sample size[10].

Inclusion criteria: School students of 7-10 grade of Lahore grammar school and Al'Ala school, both genders, with age group 13-17 years and undergraduates' health sciences students from

university of management and technology, Lahore of age range 19-25 years were included.

Exclusion criteria: Students with recent injury, trauma or surgery, students not willing to participate were excluded.

Data collection procedure: After verbal Informed consent the data was obtained from students' data was collected by using convenient sampling. Physical performance tests for measuring strength (sit-ups), flexibility (Zipper, sit and reach, dorsiflexion) and balance (Flamingo test) were demonstrated and were asked to perform. The data was recorded in the form of questionnaires by the investigators on the basis of physical performance tests result. Data on both dominant and non-dominate side were recorded. The demographic data of these participants were also recorded.

Physical performance tests:

Flexibility Tests

a) Sit and reach test (Whole body flexibility) [11]
b) Zipper test (Upper extremity flexibility) [12]
c) Ankle dorsiflexion test (calf muscle flexibility)[13]
2- Strength Test
a) Sit-ups strength test [14]
3- Balance Test
a) Flamingo test [15]

Data Analysis: Data was analyzed by Statistical Package for the social sciences (SPSS) version 21:00. Data was analyzed in form of frequencies, means, standard deviation and paired sample T test. Categorical data was analyzed in form of frequencies and percentages and numerical data (continuous) was analyzed in form of mean, standard deviation. Paired sample T test was applied to analyze performance measures difference between groups.

RESULTS

According to the findings of tests performed, following results were reported on both dominant and non-dominant limbs. On dominant side, to measure Flexibility, in Sit and Reach Test, University students had more positive scoring (28%) than school students (18%). In Zipper test, school students showed more positive scoring (74%) than university students ((72%). In Dorsiflexion test, University students had more limited ranges (78%) than school students (74%) In Sit-ups, University students had more percentage of excellent grades than school students however school student had more percentage of good grades than university students. Flamingo test was performed for balance the scoring of which showed that University students had more sways or falls (52%) than school students (50%).

On non-dominant side, in Sit and Reach Test, University students had more positive scoring (28%) than school students (18%). In zipper test, school students had more positive scoring (62%) than university students (40%). In Dorsiflexion test, school

students had more limited ranges (72%) than university students (70%). To measure strength in Sit ups, University students had more percentage of excellent grades than school students however school student had more percentage of good grades than university students. For balance, in flamingo test, school students had more sways or falls (72%) than university students (58%).

There is no difference in gender in sit and reach, zipper and dorsiflexion test however in sit ups test male performed better than female and in flamingo test on dominant side female performed better and on non-dominant male performed better. Among school students, 36% were involved in physical activities while among university students, 54% were involved in physical activities. Those involved in physical activities performed well in all tests as compared to those who weren't involved in physical activities. On the basis of physical activity all tests showed more positive results of the students who were involved in physical activity and who were not involved in physical activity showed more negative results.

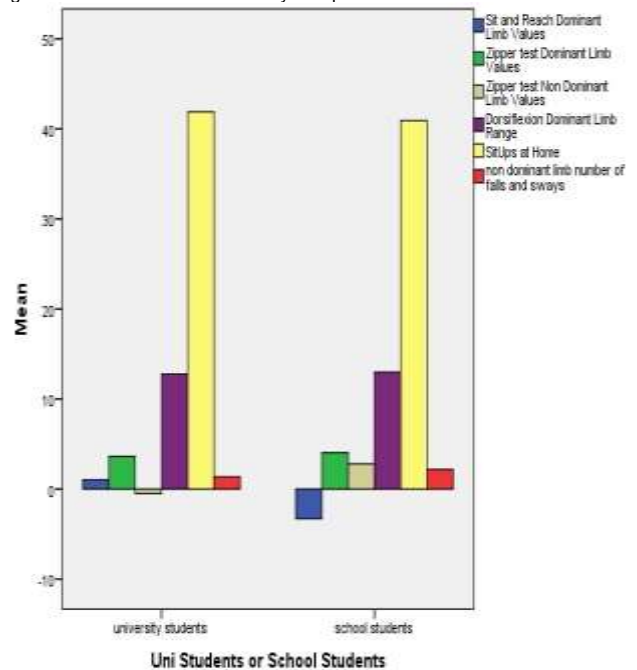Figure 1: Bar chart of means of Physical performance tests results.

Table-1: Variation between school and university students in flexibility tests.

	Sit and reach				Zipper test				Dorsiflexion range Goniometry			
	Dominant		Non-Dominant		Dominant		Non-Dominant		Dominant		Non-Dominant	
	School (n=50)	University (n=50)	School (n=50)	University (n=50)	School (n=50)	University (n=50)	School (n=50)	University (n=50)	School (n=50)	University (n=50)	School (n=50)	University (n=50)
Positive	5	18	9	14	37	36	31	20	4	3	7	5
Negative	14	9	13	8	4	7	7	22	37	39	36	35
Neutral	31	23	28	28	9	7	12	8	9	8	7	10
P value	0.006		0.031		0.698		0.004		0.857		0.337	

Table-2: Sit up test and Flamingo test result in school and university students

Sit ups			Flamingo test				
				Dominant		Non-Dominant	
	School (n=50)	University (n=50)		School (n=50)	University (n=50)	School (n=50)	University (n=50)
Excellent	12	18	Normal	25	24	14	21
Good	16	8	Fall or sway	25	26	36	26
Above average	8	8	Total	50	50	50	50
Average	7	9	P-Value	0 .913		0.036	
Below average	5	5					
Poor	2	2					
P value	0.628						

DISCUSSION

In the present study Sit ups excellent results were reported in majority of university students (36%). Sit and reach test was found better in university (32%), zipper test positive results were better in school students. Dorsiflexion test normal values were more in university (18%). Flamingo test showed 45% university students had good balance. There was statistically significant difference between groups in zipper (P=0.004), flamingo (P=0.036) on non-dominant side and sit and reach dominant (P=0.006) and non-dominant side (P=0.031) among groups.

A previous study performed to analyze physical fitness parameters of school going children of Khyber Pakhtunkhwa-Pakistan (KPK)[16]. Figures in a previous study from KPK schools imply that balance, strength and flexibility improve with age. In the current study significant difference was observed in strength as male performed better than females in strength test[17].

The present study indicated limb difference from dorsiflexion test consecutively verifying that the dominant side of limb flexibility is better in contradiction with earlier study conducted on navy students demonstrating no limb difference in ankle dorsiflexion[18].

The present study states that physically active students succeeded in physical performance tests in comparison those possessing sedentary lifestyle. This is supported by a similar study involving four fitness tests, where the students frequently engaged in physical activities had prosperous performance[10].

A study conducted on non-athlete adolescent reported there is no significant difference in balance measure by Y test, between dominant and non-dominant sides[19]. The present study found out that there is no significant different between balance measured by flamingo test on dominant side among different age groups (school and university students) but there was significant difference of balance on non-dominant side among groups.

A previous study was conducted on male soccer athletes in to evaluate the normative data for hip strength, flexibility, stiffness and the effect of age and limb dominance. The dominant side showed better flexibility in both age groups (p=0.006). In Adult athlete's hip stiffness was more on non-dominant side. In addition, there were no clinically relevant inter-limb differences[20].

The present study reported limitation of not including endurance testing, as endurance is also an important physical performance measure. We recommend researchers to study on behavior patterns and physical performances of different aged normal individuals.

CONCLUSION

Both groups showed good physical performance measures. Flexibility test showed better results in school students. Strength test showed better result in university students whereas, balance test reported better in school students

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