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## Flexibility of the lower back and hamstring muscles among 14 to 17 year old school boys

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### Abstract

The aim of the study was to access and compare lower back and hamstring muscles flexibility among 14 to 17 year old school boys. For the purpose of this study 400 school boys studying in various schools of Delhi were selected. The age of the subjects ranged between 14 to 17 years. The selected subjects were divided into four groups, Fourteen (n=100), Fifteen (n=100), Sixteen (n=100) and Seventeen (n=100) according to their age category. Lower back flexibility was measured by sit and reach test using Flexomeasure. Descriptive statistics, one way ANOVA and for pair wise comparison LSD was applied. There was a significant difference between fourteen and seventeen year age group and fifteen and seventeen year age group while there was no significant difference in the remaining age groups. It can be concluded that seventeen age boys have better lower back flexibility than fourteen and fifteen year old school boys. The significant value was set at 0.05.

**Keywords:** Flexibility, sit and reach, Flexomeasure

### 1. Introduction

Flexibility or limberness refers to the absolute range of movement in a joint or series of joints, and length in muscles that cross the joints to induce a bending movement or motion. Flexibility varies between individuals, particularly in terms of differences in muscle length of multi-joint muscles. Gender, age, and genetics are important for range of motion. Each individual is born with a particular range of motion for each joint in their body. In the book Finding Balance by Gigi Berardi, the author mentions three limiting factors: Occupational demands, movement demands and training oversights (Berardi, 2013) [1]. Movement demands include strength, endurance and range of motion. Training oversights occurs when the body is overused (Berardi, 2013) [1]. Many factors are taken into account when establishing personal flexibility: joint structure, ligaments, tendons, muscles, skin, tissue injury, fat (or adipose) tissue, body temperature, activity level, age and gender all influence an individual's range of motion about a joint. Individual body flexibility level is measured and calculated by performing a sit and reach test, where the result is defined as personal flexibility score (Franklin, 2003) [5]. Physical fitness plays an important role in maintaining a good health (Corbin & Pangrazi, 1993) [2] Epidemiologists say that lack of physical fitness is one of the reasons for the increase in childhood obesity in the last two decades. Through standardized physical educational program, physical fitness of the children is regulated. Physical fitness testing is routine component of physical education classes in primary and secondary school. The goals of the physical fitness-testing program are to provide continual monitoring of students fitness levels in targeted grades, to identify a student's weakness and strength so that areas in need of improvement can be seen, and to develop individualised programs (Haskell, Montoye & Orenstein 1985) [6]. One area routinely focused in most fitness tests is flexibility. Adequate flexibility is an important characteristic of physical and health related fitness. Flexibility is described as the ability to move a joint through its complete range of motion. It is the extensibility of muscles as well as the non-contractile tissues such as joint capsule, ligaments, and tendons (Cornbleet & Woolsey 1996) [3]. Importance of flexibility as a component of health-related fitness is related to prevention of orthopedic impairments later in life, especially lower back pain (Ruiz *et al.*, 2009) [10] Inflexible muscle can make the musculotendinous unit susceptible to injury and can also lead to some pathological conditions

At the joint on which it acts (Fabunmi *et al.*, 2008) [4]. Flexible muscles permit proper pelvic rotation, decrease disc compression, and avoid excessive stretch of musculatures (Kawano, *et al.*, 2010) [8].

**2. Methodology**

For the purpose of this study 400 school boys studying in various schools of Delhi were selected. The selected subjects were from different zones of Delhi. The age of the selected subjects was ranging between 14 to 17 years. The selected subjects were divided into four groups, Fourteen (n=100),

Fifteen (n=100), Sixteen (n=100) and Seventeen (n=100) according to their age category. Lower back flexibility was measured by sit and reach test using Flexomeasure. For the current research Descriptive statistics, one way ANOVA and for pair wise comparison LSD was applied. The significant value was set at 0.05.

**3. Result and analysis**

For the purpose of the study Descriptive statistics and one way ANOVA was used. The result of the current study has been displayed in the table no. 1, 2 and 3.

**Table 1:** Descriptive Statistics

Flexibility	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
14	100	27.45	6.87	0.68	26.08	28.81	5.00	42.00
15	100	28.63	8.04	0.80	27.03	30.22	9.00	46.00
16	100	30.30	8.15	0.81	28.68	31.91	10.00	50.00
17	100	31.00	8.85	0.88	29.24	32.75	4.00	51.00
Total	400	29.34	8.10	0.40	28.54	30.14	4.00	51.00

The table no. 1 reveals the descriptive analysis of flexibility of 14 to 17 years age groups. It was found that the mean values of flexibility in schools boys of fourteen (14), fifteen (15), and

sixteen (16) and seventeen (17) years is  $27.45 \pm 6.87$ ,  $28.63 \pm 8.04$ ,  $30.30 \pm 8.15$  &  $31.00 \pm 8.85$  respectively.

**Table 2:** ANOVA

Flexibility	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	775.33	3	258.443	4.025	0.008
Within Groups	25427.06	396	64.21		
Total	26202.39	399			

One-Way ANOVA displayed in table 2 indicated a significant difference in flexibility scores between groups,  $f(3, 396) = 4.025$ ,  $p < .05$ . It means the mean scores of flexibility in boys of fourteen (14) year age group, fifteen (15) year age group, sixteen (16) year age group and seventeen (17) year age group

differ significantly. So, age influence the flexibility in different age groups. It may therefore, be concluded that lower back flexibility increases from 14 years through 15 and 16 years to 17 years.

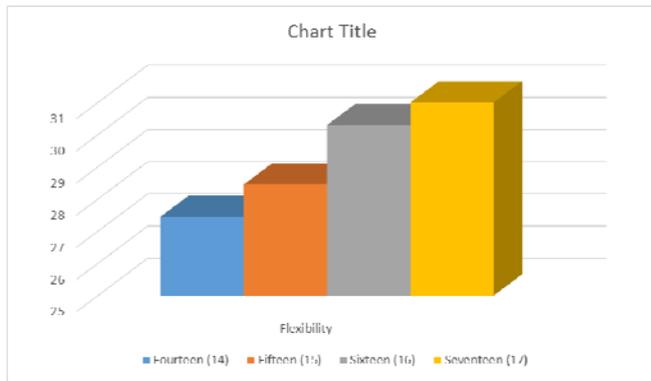
**Table 3:** Multiple Comparisons

Dependent Variable: Flexibility						
LSD						
(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
14	15	-1.18000	1.13322	.298	-3.4079	1.0479
	16	-2.85000*	1.13322	.012	-5.0779	-.6221
	17	-3.55000*	1.13322	.002	-5.7779	-1.3221
15	16	-1.67000	1.13322	.141	-3.8979	.5579
	17	-2.37000*	1.13322	.037	-4.5979	-.1421
16	15	1.67000	1.13322	.141	-.5579	3.8979
	17	-.70000	1.13322	.537	-2.9279	1.5279

\*. The mean difference is significant at the 0.05 level.

A LSD test was applied to measure the significant difference between the groups. Table 3 reveals that the flexibility of sixteen (16) year old school boys was statistically higher (M=30.43) than fourteen (14) year old school boys (M=27.45). Table 3 also reveals that the flexibility of the seventeen year old school boys (17) was statistically higher

(M=31.00) than the fourteen year (14) old school boys (M=27.45) and fifteen year (15) old school boys (M=28.63). The graphical representation of mean values of flexibility across all selected age groups are displayed in the figure 1.



**Fig 1:**

#### 4. Discussion

One-Way ANOVA indicated a significant difference in flexibility scores between groups. The mean scores of flexibility in boys of fourteen (14) year age group, fifteen (15) year age group, sixteen (16) year age group and seventeen (17) year age group differ significantly. So, age influence the flexibility in different age groups. The flexibility of sixteen (16) year old school boys was statistically higher than fourteen (14) year old school boys and the flexibility of the seventeen year old school boys (17) was statistically higher than the fourteen year (14) old school boys and fifteen year (15) old school boys. Flexibility in both males and females is likely to decline after age 17, in part as a consequence of a decline in physical activity and normal aging. The primary health results assumed to be linked with flexibility are inhibition of and relief from low-back pain, prevention of musculoskeletal damage, and better-quality posture. These relations have been considered in adults, with equivocal outcomes (Plowman, 1992) [9]. Though flexibility has long been included in national youth fitness tests, it has proven problematic to establish a connection between flexibility and health (Institute of Medicine, 2012) [7]. Regular exercise increases overall flexibility and range of movement by decreasing fat, increasing muscle mass and keeping your joints moving.

#### 5. Conclusion

There was a gradual increase in flexibility from fourteen (14) to seventeen (17) age groups. The mean scores of flexibility in boys of fourteen (14) year age group, fifteen (15) year age group, sixteen (16) year age group and seventeen (17) year age group differ significantly. So, age influence the flexibility in selected age groups. Lower back and hamstring muscles flexibility increases from 14 years through 15 and 16 years to 17 years. It may be concluded that that the lower back and hamstring muscles flexibility of sixteen (16) year old school boys is higher than fourteen (14) year old school boys. It can be further concluded that lower back and hamstring muscles flexibility of the seventeen year old school boys (17) is higher than the fourteen year (14) old school boys and fifteen year (15) old school boys.

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