



## ANALYSIS OF AGE CHANGES IN FLEXIBILITY OF MALE ADOLESCENTS OF KARNATAKA

(Received on: 28 March 2017, Reviewed on: 27 May 2017 and Accepted on: 22 July 2017)

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### Abstract

The advent of technology in day to day life has considerably reduced physical activity levels of individuals. Physical education is being substituted by academic endeavors and other similar accomplishments of adolescents. Health related physical fitness has to be given prime importance during adolescence for enhancement of productivity of individual in later adulthood. Flexibility is a health related component of physical fitness that relates to the range of motion available at a joint. The purpose of the present investigation was to determine the age changes associated with flexibility in male high school students. The subjects for the study were 950 adolescents studying in various schools of Karnataka state. The subjects were selected from various age groups like 13 to 14 years (N=303); 15 to 16 years (N=323); and 17 to 18 years (N=324). Modified sit and reach test (Meredith and Welk, 2007) was performed by the subjects to measure the flexibility. The obtained results were statistically treated using descriptive statistics including mean and standard deviation. Further, Analysis of variance was performed with LSD post hoc test to find age differences in flexibility. The present investigation on flexibility of high school male students of Karnataka reveals that there is an improvement in flexibility as age advances. The flexibility is lowest in 13 to 14 years and the highest in 17 to 18 years.

**Keywords:** High School, Adolescents, Health, Physical Fitness, Flexibility, Injury Risk.

### Introduction

The advent of technology in day to day life has considerably reduced physical activity levels of individuals. Physical education is being substituted by academic endeavors and other similar accomplishments of adolescents. Globalization has paved the way for packaged and processed foods in the lives of adolescents. Needless to say that the adolescents crave for such foods including carbonated drinks, maida based foods, fried foods and those made from sugar. Sleep deprivation has been reported in adolescents mainly due to increased screen timing. Mobile phones, internet browsing in the computers and video games. Health related physical fitness has to be given prime importance during adolescence for enhancement of productivity of individual in later adulthood. Physical fitness is a physiological state of well-being that provides the foundation for the tasks of daily living, a degree of protection against chronic disease and a basis for participation in sport. In essence, physical fitness describes a set of attributes relating to how well one performs physical activity. It can be described as a condition that helps us look, feel and do our best. Physical fitness is a general state of health and well-being and, more specifically, the ability to perform aspects of sports or occupations. Physical fitness is generally achieved through correct nutrition (Tremblay, et. al., 2010), moderate-vigorous physical activity (De Groot and Fagerstrom, 2010), exercise and rest (Malina, 2010). Health-related fitness involves skills that enable one to become and stay physically healthy. It refers specifically to those components of physical fitness associated with some aspect of good health and/or disease and not necessarily sports performance. The health-related components of physical fitness are: cardio-respiratory endurance, muscular endurance, muscular strength, body composition, and flexibility (Corbin, C. B. et. al., 1981). Flexibility is a health related component of physical fitness that relates to the range of motion available at a joint. "Flexibility is usually interpreted as the range of motion at a particular



joint, measured in degrees”. Extensibility of the soft tissue, ligaments and especially of the muscle and the anatomical structure of the joint help to determine the degree of flexibility. Flexibility has been operationally defined as “the intrinsic property of body tissues, including muscle and connective tissues, that determines the range of motion achievable without injury at a joint or group of joints” (IOM, 2012). Flexibility is specific to the movement and there is little relationship of flexibility measures to sex and age. Specialized forms of physical activity appear to develop specific patterns of flexibility. Flexibility has been associated with injury risk (Plowman, 1992). While it is logical that limited static flexibility will more likely result in an overstretched muscle during vigorous activity, there is little evidence that greater than normal levels of static flexibility will decrease injury risk. If anything, people at both extremes of static flexibility may be at a higher risk for musculoskeletal injuries. There is even less known about the association between dynamic flexibility and injury risk. The purpose of the present investigation was to determine the age changes associated with flexibility in male high school students.

### Methodology

Total 950 adolescents studying in various schools of Karnataka state were selected as subjects. The subjects were selected from various age groups like 13 to 14 years (N=303); 15 to 16 years (N=323); and 17 to 18 years (N=324). Modified sit and reach test (Meredith and Welk, 2007) was performed with the help of a sit and reach box with an extended scale of nine inches or twenty-three centimeters for measuring flexibility. A subject was made to sit on the floor after removal of their shoes with leg stretched out straight ahead. Then, they placed their soles of the feet flat against the box. Both knees were locked and pressed flat to the floor, the body portion from hip to head were placed straight against the wall. The palms were kept facing downwards and the hands kept on top of each other and made them to reach forward towards the slide as far as possible without any jerky movements from the body. Three trials were conducted on every subject and the reading was recorded in centimeter. Among three tested trials, the best trial was considered as their score on flexibility (Katch, McArdle, and Katch, 2011). The obtained results were statistically treated using descriptive statistics including mean and standard deviation. Further, Analysis of variance was performed with LSD post hoc test to find age differences in flexibility.

### Results & Discussion

Below given table provides results on descriptive statistics including Mean and Standard Deviation of flexibility.

TABLE 1.  
 MEAN AND STANDARD DEVIATION OF FLEXIBILITY IN HIGH SCHOOL STUDENTS OF KARNATAKA

	Sit and Reach (in cms)		
	13 – 14 years	15 – 16 years	17 – 18 years
Mean	24.87	26.16	29.36
S.D	8.03	6.69	7.93

The above results were subjected to one-way Analysis of Variance to find differences in mean scores between the three age groups. The results are provided in table 2.

TABLE 2.  
 SUMMARY OF ANALYSIS OF VARIANCE BETWEEN AGE GROUPS ON FLEXIBILITY OF HIGH SCHOOL STUDENTS

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3378.022	2	1689.011	29.53	.000
Within Groups	54171.701	947	57.203		
Total	57549.723	949			

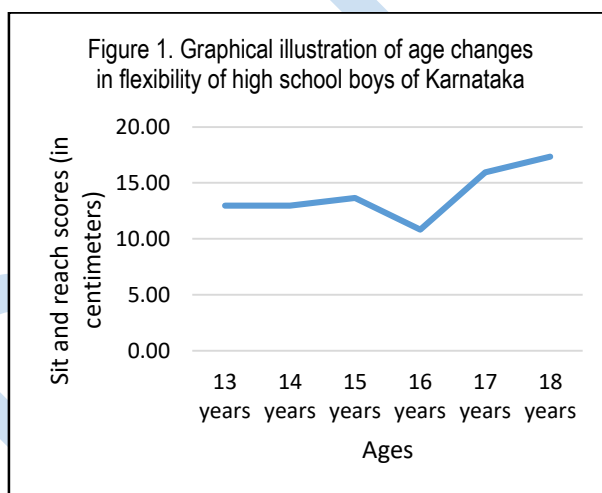


From table 2 it is evident that there exists significant difference between the three age groups under investigation on flexibility. The obtained 'F' value is clearly higher than the tabulated value (3.00) required for significance at 0.05 levels. Further, LSD post hoc test was employed to elicit differences between groups. The results are provided in table 3.

TABLE 3.  
 SUMMARY OF DIFFERENCES IN FLEXIBILITY BETWEEN DIFFERENT AGE GROUPS

(I) Age groups	(J) Age groups	Mean Difference (I-J)	Std. Error	Sig.
13 to 14 years (24.87)	15 to 16 years (26.16)	-1.28795*	.60489	.033
	17 to 18 years (29.36)	-4.48652*	.60444	.000
15 to 16 years(26.16)	17 to 18 years(29.36)	-3.19857*	.59469	.000

From table 3 it can be inferred that there is significant difference between different age groups in flexibility. It is clearly evident that there is significant difference between 13 to 14 years and 15 to 16 years high school boys; 13 to 14 years and 17 to 18 years high school boys; and 15 to 16 years and 17 to 18 years high school boys. The above results are graphically depicted in figure 1.



## Discussion

From the present investigation it is understood that as age advances a significant improvement in flexibility occurs. The reasons can be attributed to their physical activity levels and patterns. Since there are no adequate number of Physical Education Teachers at Primary schools of Karnataka, the flexibility remained lesser as compared to higher ages. Due to considerate number of appointments in High School Physical Education Teachers in the past few years, we could find higher flexibility in 15 to 18 years high school boys. As age advances the boys become more independent in taking up physical activities and sports, especially after school hours. Dutt (2005) in a similar study reported the flexibility of boys ranging in age from 8-18 years. At the age of 8 years, a mean value of 3.8 inches was observed and with increase in age a slow and continuous decline in this parameter was witnessed up to the age of 11 years. Thereafter, a general trend of increase in modified sit and reach scores were observed leading to a maximum average value of 5.4 inches exhibited by 18-year-old boys. The unique pattern of age- and sex-associated variation is related to the growth of the lower extremities and the trunk during adolescence. In boys the nadir in low-back flexibility coincides with the adolescent growth spurt in leg length. In both boys and girls, the increase during adolescence coincides with the growth



sput in trunk length and arm length, which influences reach. Flexibility in both males and females tends to decline after age 17, in part as a result of a decline in physical activity and normal aging (Consensus Study Report, 2013).

### Conclusion

The present investigation on flexibility of high school male students of Karnataka reveals that there is an improvement in flexibility as age advances. The flexibility is lowest in 13 to 14 years and the highest in 17 to 18 years.

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