

Comparative study of minimal muscular fitness among rural and urban students of Kashmir

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■ ABSTRACT

The objective of the present study was to compare the minimal muscular fitness between rural and urban students in the age group of 13-17 years. The study was carried out on 500 students of both the sexes in which 250 were rural (125 boys + 125 girls) and 250 were urban (125 boys + 125 girls). The study used a physical activity survey to measure the minimal muscular fitness by administering the six item Kraus-Weber Exercise Test. The data collected were analyzed and compared by using the statistical procedures. The results showed that there was a significant difference ($p < 0.05$) between rural and urban students. The study further revealed more number of fitness failures when compared to last such studies in India especially the girl subjects. The study concluded that an immediate and concerted effort be made by all the parents and school administrators to improve the physical fitness of students in general and muscular fitness in particular.

■ **Key Words** : Kraus-weber tests, Muscular fitness, Flexibility, Rural, Urban students

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In order to carry out the daily tasks without undue fatigue or to enjoy leisure-time pursuits, one requires a certain degree of physical fitness. Physical fitness, when viewed under a broad vision is a combination of several components like endurance, flexibility, speed, strength, agility, body composition etc. (Singh *et al.*, 2008). A physically fit person looks better, feels better, thinks better and so lives better. Likewise, physical fitness is closely associated with good health. A certain level of strength and flexibility of particular key muscle groups is necessary for the function of the body below which the health of the individual seems to be in danger (Gharote, 2000). Muscular strength refers to the muscles ability to generate force against resistance while as flexibility is the ability to perform the joint action through the range of motion (Prentice, 1994; Singh *et al.*, 2008). Kraus and Hirschland (1953) prepared a battery of 6 test items after 18 years of clinical experience popularly known as Kraus-Weber exercise test which is a series of exercises that measures the strength and flexibility of the back, abdominal, psoas and hamstring muscles

(Gharote, 2000; Safrit and Wood, 1995). The Kraus-Weber exercise test is useful in recognizing and treating the problems of muscle weakness and muscle tightness (Gill *et al.*, 2010). The six items of the test are:

- Test I (A+P) measures strength of abdominal plus psoas muscles.
- Test II (A-P) further measures strength of abdominal without psoas muscles.
- Test III (P) measures strength of psoas and lower abdominal muscles.
- Test IV (UB) measures the strength of upper back muscles.
- Test V (LB) measures the strength of lower back muscles.
- Test VI (B+H) measures flexibility of back and hamstring muscles.

Several studies have been conducted to measure the minimal muscular fitness in different categories, including students in United States and European countries. The early work of Kraus and Hirschland in 1954 showed that 56.6 per

cent of 4458 American children and 8 per cent of 1987 European children failed in one or more of the 6 items of the Kraus-Weber exercise test. However few studies have assessed minimal muscular fitness of Indian students. The first such study in India was conducted in 1975 by Gharote *et al.* (1976) on 375 school children and reported a failure percentage of 40.3 per cent. Thereafter, several studies assessed the minimal muscular fitness of Indian students and a recent such study was conducted by Kulkarni *et al.* (2010) in 2010 and reported a failure percentage of 28.7 per cent. No doubt these studies provide information about minimal muscular fitness of Indian students but are documented outside the Kashmir. This situation called for an investigation to evaluate the minimal muscular fitness of rural and urban students of few districts of Kashmir valley.

The aim of the present study was to assess and compare the minimal muscular fitness using Kraus-Weber test among rural and urban students of Kashmir and also to compare the same with the results of the previous studies.

METHODOLOGY

Five hundred school going children’s of both the sexes studying in 7th to 12th classes were selected randomly for this study. The subjects were in the age group of 13 to 17 years and the conformation of age was done from the school registers. The subjects were selected from both government as well as private schools in order to avoid the socio-economic status because the higher classes of the society prefer to send their wards to renowned private institutes. Hundred subjects were selected from each age category, giving a total of five hundred subjects. Out of 100 from each age group 50 subjects were from rural region and 50 were from urban region. Further out of 50, 25 were male and 25 were female subjects. Thus, a

total of 250 rural and 250 urban subjects were selected for the study, in which 125 were rural males, 125 were rural females, 125 were urban males and 125 were urban females.

et al., 2011) was used to compare successes and failures in the Kraus-Weber exercise test on the basis of region and gender. Also the results of this study were compared with the preceding studies conducted in various parts of the world.

OBSERVATIONS AND DISCUSSION

The results presented in Table 1 showed that rural male subjects had the best performances in test I and test IV (100% pass) and their least successful performance in test VI (82.4% pass). Urban male subjects had also the best performances in test I and test IV (100% and 96% pass, respectively) and their least successful performance in test

Table 1: Frequency percentage of subject’s performance on each of the Kraus-Weber exercise test, region wise and gender wise

Test	Rural boys		Urban boys		Rural girls		Urban girls		Total	
	Success	Failure	Success	Failure	Success	Failure	Success	Failure	Success	Failure
I A+P	125 (100%)	0 (0%)	125 (100%)	0 (0%)	115 (92%)	10 (8%)	110 (88%)	15 (12%)	475 (95%)	25 (5%)
II A-P	120 (96%)	5 (4%)	116 (92.8%)	9 (7.2%)	106 (84.8%)	19 (15.2%)	110 (88%)	15 (12%)	452 (90.4%)	48 (9.6%)
III P	118 (94.4)	7 (5.6%)	115 (92%)	10 (8%)	112 (89.6%)	13 (10.4%)	105 (84%)	20 (16%)	450 (90%)	50 (10%)
IV UB	125 (100%)	0 (0%)	120 (96%)	5 (4%)	117 (93.6%)	8 (6.4%)	112 (89.6%)	13 (10.4%)	474 (94.8%)	26 (5.2%)
V LB	112 (89.6%)	13 (10.4%)	110 (88%)	15 (12%)	113 (90.4%)	12 (9.6%)	107 (85.6%)	18 (14.4%)	442 (88.4%)	58 (11.6%)
VI B+H	103 (82.4%)	22 (17.6%)	96 (76.8%)	29 (23.2%)	115 (92%)	10 (8%)	111 (88.8%)	14 (11.2%)	425 (85%)	75 (15%)

Table 2: Successes and failures in the number of Kraus-Weber exercise test items in each region and gender

Category	Successes	Failure in number of Kraus-Weber test items				Total
		1 Item	2 Items	3 Items	4 Items	
Rural boys	99(79.2%)	13(10.4%)	7(5.6%)	4(3.2%)	2(1.6%)	125
Rural girls	76(60.8%)	35(28%)	8(6.4%)	3(2.4%)	3(2.4%)	125
Urban boys	81(64.8%)	32(25.6%)	5(4%)	4(3.2%)	3(2.4%)	125
Urban girls	65(52%)	40(32%)	8(6.4%)	8(6.4%)	4(3.2%)	125
Total	321(64.2%)	120(24%)	28(5.6%)	19(3.8%)	12(2.4%)	500

VI (76.8% pass). On the other hand the rural female subjects showed best performances in test IV (93.6% pass) and their least successful performance was in test II (84.8% pass). Urban female subjects also showed best performances in test IV (89.6% pass) but their least successful performance were found to be in test III (84% pass).

The number of rural male and female subjects who passed the entire six item Kraus-Weber exercise test was 79.2 per cent and 60.8 per cent, respectively, thus, constituting a total pass percentage of 70 per cent from the rural region. In contrast, the number of urban male and female subjects who passed the entire six item Kraus-Weber exercise test was 64.8 per cent and 52 per cent, respectively, thus, constituting a total pass percentage of 58.4 per cent from the urban region (Table 2).

Further, the number of male and female subjects who passed the flexibility test *i.e.* item VI of the Kraus-Weber exercise test was 79.6 per cent and 90.4 per cent, respectively, thus, constituting a total pass percentage of 85 per cent for the flexibility test. The results further revealed that an overall pass percentage on the entire six item Kraus-Weber exercise test was 64.2 per cent only (Table 2).

The obtained values were subjected to comparisons through statistical procedures in which Chi square test was used. The rural subjects were found to be superior in minimal muscular fitness as compared to their urban counterparts (Table 3). The calculated χ^2 between rural and urban subjects was found to be 7.28 at 0.05 level of significance ($df=1$) which is higher than the tabulated χ^2 value of 3.84. Further, male subjects were found to have an upper hand in minimal muscular fitness as compared to females (Table 4). The χ^2 calculated between male and female subjects was found to be 13.2 at 0.05 level of significance ($df=1$) which was higher than the tabulated χ^2 value of 3.84.

Region	Kraus-weber tests	
	Success	Failure
Rural	175	75
Urban	146	104
Total	321	179

P<0.05 (significant)

Sex	Kraus-Weber tests	
	Success	Failure
Boys	180	70
Girls	141	109
Total	321	179

P<0.05 (significant)

Flexibility on the other hand was found to be more in female subjects when compared to their male counterparts (Table 5). The χ^2 calculated between male and female subjects

in the flexibility test was found to be 11.42 at 0.05 level of significance ($df=1$) which was also higher than the tabulated χ^2 value of 3.84.

Table 5: Distribution with respect to gender (flexibility test)

Sex	Flexibility test (test item VI)	
	Success	Failure
Boys	199	51
Girls	226	24
Total	425	75

P<0.05 (significant)

From the results obtained in this study it was observed that the minimal muscular fitness was significantly higher in the rural subjects (Table 3) who performed better than their urban counterparts in all the six items of the Kraus-Weber exercise test. This finding is in consistent with the observations of the previous studies (Hamzat and Sanya, 1999; Tsimeas and Tsigilis, 2005). Muscular strength, one of the main components of physical fitness has been found to be superior in the rural subjects as compared to urban subjects (Hamzat and Sanya, 1999).

The study further revealed that the minimal muscular strength was significantly higher in male subjects (Table 4) who obtained higher scores than their female counterparts in the Kraus-Weber exercise test. This observation is in consistent with the previous studies (Gharote *et al.*, 1976; Kulkarni *et al.*, 2010). The differences observed in the strength of trunk and abdominal muscles of the male subjects could be accounted by the fact that the male subjects enjoy more freedom to participate in the physical activities as compared to girl subjects.

Flexibility refers to the looseness or suppleness of the body or specific joints (Prentice, 1994; Singh *et al.*, 2008). Flexibility of the back and hamstring muscles of the male and female subjects were also determined and compared in this study. It was observed that females were more flexible (Table 5) than their male counterparts. The observation that females performed better in the back and hamstring flexibility test is in line with the observations of the previous studies (Babalola *et al.*, 2008). This gender difference may be attributed to hormonal differences between male and female subjects.

According to Baumgartner and Jackson (1999) there are no partial scores for grading in the Kraus-Weber exercise test. Therefore, success is only ascribed to subjects who passed the entire six item Kraus-Weber exercise test. The overall failure percentage in the present study was 35.8 per cent which is comparable with the previous studies (Babalola *et al.*, 2008; Gharote *et al.*, 1976; Gill *et al.*, 2010) (179 out of 500 subjects). Out of this, 24 per cent (120 subjects out of 500) were single test item failures, 5.6 per cent (28 out of 500 subjects) were double item test failures, 3.8 per



cent (19 out of 500 subjects) were three item test failures and 2.4 per cent (12 subjects out of 500) were four item test failures. Thus, 11.8 per cent (59 out of 500 subjects) failed in more than one test items.

The early work of Kraus and Hirschland (1953) showed that 56.6 per cent of 4458 American children and 8 per cent of 1987 European children failed in one or more of the six test items of the Kraus-Weber exercise test. Repeated study by the same workers (Kraus and Hirschland, 1954) revealed that 57.7 per cent of 4264 American children and 8.6 per cent of 2870 European children failed in one or more of the six test items. The first such study in India was conducted by Gharote and Ganguly (1975) on 375 school children and reported a failure percentage of 40.3 per cent. Another study conducted by Gharote *et al.* (1976) reported still higher percentage of failures to the extent of 63.9 per cent. Gharote (2000) conducted a study on 250 school children and revealed a failure percentage of 20.8 per cent. Babalola *et al.* (2008) conducted a study on 200 students of Ibadan University and reported a failure percentage of 48 per cent. Thereafter a study of 320 school children in India was conducted by Kulkarni *et al.* (2010) and revealed a failure percentage of 28.75 per cent.

Thus, the overall trend before this study had been towards a decline in the failure percentage. Gharote (2000) had attributed this to be the growing promotion and popularity of sports and physical activities in schools, in his last study conducted in 2000. An increase in failure percentage from 20.8 per cent in Gharote (2000) study to 28.75 per cent in Kulkarni *et al.* (2010) study to 35.8 per cent in this study could be the result of increasing mental stress on the school going children due to growing academic competition and expectations from the family and society Kulkarni *et al.* (2010).

Maximum failure percentage of 15 per cent (75 subjects out of 500) was found in the flexibility test (Item VI) followed by 11.6 per cent (58 subjects out of 500) in the lower back muscle strength test (Item V) and the least failure percentage was found to be in test item I (0%) and test item IV (5%). These findings are in line with the observations made by the previous studies (Babalola *et al.*, 2008; Gharote and Ganguly, 1975; Gharote *et al.*, 1976; Gharote, 2000, Gill *et al.*, 2010).

The six item Kraus-Weber exercise test used in this study is simple, inexpensive and quick to administer as it involved practically no instrumentation. The exercise components of the Kraus-Weber test can also be used as a part of remedial exercise programme for subjects who have muscular insufficiency.

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