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A study on assessing minimum muscular fitness of school children – A Kraus-weber test

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Abstract
The presented study was to assess the school children's minimum muscular fitness by using Kraus-weber test. In the study total one hundred fifty four (154) subjects were taken (88 boys and 66 girls) all were students of Jawahar Navodaya Vidhyalaya, Balrampur Chhatishghar India. Their age ranging from 11yr to 14yr. The data were assessed all six tests items of Kraus-weber test. Item 1 straight leg sit ups (A+P), Item 2 bend knee sit ups (A-P), Item 3 supine leg raise (P), Item 4 prone back raise (UB), Item 5 prone leg raise (LB), Item 6 floor touch (F) in school only. The collected data was analyzed by computing the descriptive statistics and chi square test to assess the profiling of children's minimum muscular fitness. For testing the hypothesis, the degree of significance was set at 0.05. Statistical analysis was conducted by using statistical packages for social science (IBM SPSS 20 Version). As a result the findings states that there is no significant association was found between gender and minimum muscular fitness as $\alpha > 0.05$, $\chi2$ (1) = 3.143, α = 0.076, where we do not reject the null hypothesis whereas there is a statistically significant association between the age groups (11yr-14yr) and the minimum muscular fitness as α -value < 0.01, $\chi2$ (3) = 36.805, hence the null hypothesis is rejected. Therefore it conclude that in the selected children of the study minimum muscular fitness is not significantly associated with gender but the minimum muscular fitness is significantly associated to the age of the children.

Keywords: Kraus-weber test, minimum muscular fitness test, school children's muscular fitness

Introduction
In the 1950s, Hans Kraus and Sonja Weber created the Kraus-Weber Minimum Muscular Fitness Test. The primary postural (core) muscles' strength and flexibility are measured by the six-item medical fitness test. Five strength tests and one general flexibility test make up the exam. This test helps to assess that an individual is having at least minimum muscular fitness strength and flexibility or not. By the Kraus -Weber test we can easily check out the minimum strength of our children and can do need full if they require to improve and also get the weaker section of the child's body at initial stage. (https://en.wikipedia.org/wiki/Kraus%E2%80%93Weber_test). The six components that make up the Kraus-Weber Test. These assessments are designed to gauge a person's minimal level of muscular fitness. In fact, they assess the degree of strength and flexibility of a few critical muscle groups below which it appears that a healthy person's ability to operate as a whole is in jeopardy. These assessments are given a pass-fail rating. Six tests assess a person's minimal level of muscular fitness.

Test No 1: (A+P) Straight leg sit up involving abdominal plus psoas muscle to test their strength of particular muscles.

Test No 2: (A-P) Bend knee sit up using only abdominal muscle without psoas muscle to test the strength of abdominal muscles.

Test No 3: (P) Both leg raise in Supine position it involving psoas plus lower abdominal muscles to test their strength of particular muscles.

Test No 4: (UB) Back raise in prone position to test the strength of upper back muscle.

Test No 5: (LB) Both leg raise in prone position for testing the strength of lower back muscle.

Test No 6: (F) It is known as floor-touch test. It measures the flexibility of trunk.

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Procedure and methodology

For the study there is total one hundred fifty four (154) subjects were taken (boys and girls) all were students of Jawahar Navodaya Vidhyalaya, Balrampur Chhatishghar India. Their age ranging from 11yr. to 14yr. The study purpose was explained to all the subjects. Each participant provided consent before participation in testing procedures. The study selected the following six tests items of Kraus - Weber test straight leg sit ups (A+P), bend knee sit ups (A-P), supine both leg raise (P), prone back raise (UB), prone both leg raise (LB), floor touch (F) in school premises only.

Data analysis and interpretation

The collected data was analysed by computing the descriptive statistics and chi square test to assess the profiling and association of children's muscular strength. For testing the hypothesis, the degree of significance was set at 0.05. Statistical analysis was conducted by using statistical packages for social science (IBM SPSS 20 Version).The findings are presented in table 1, 2, 3, and table 4 and the graphical representation of the percentage of frequencies of success and Failure as per the age and gender is presented in figure 1 and figure 2.

Table 1: Descriptive statistics of successes and failures in each gender at different age category

| | | Success | Failure in no of Kraus Weber test items | | | | Total |
			1 item	2 item	3 item	4 item	
11yr.	B	05	07	03	0	0	15
	G	12	06	02	01	0	21
	T	17	13	05	01	0	36
12y r.	B	26	11	01	0	0	38
	G	20	05	01	0	01	27
	T	46	16	02	0	01	65
13yr.	B	20	05	01	01	0	27
	G	07	03	03	01	0	14
	T	27	08	04	02	0	41
14yr.	B	07	01	0	0	0	08
	G	03	01	0	0	0	04
	T	10	02	0	0	0	12
Total	B	58	24	05	01	0	88
	G	42	15	06	02	01	66
	T	100	39	11	03	01	154

B-boys, G-girls, T-total

The table no.01 reveals that in 11yr. Age category 33.33% boys and 57.14% girls have successfully completed all the six item of Kraus-weber test, Age category of 12yr. 68.42% boys and 74.07% girls successfully completed all the six item of the test, in 13yr. Age category 74.07% boys and 50% girls successfully completed all the six item of the test and 14yr age category 87.5% boys and 75% girls has been successfully completed all the six item of the test. And overall of all age category total 65.90% boys and 63.63% girls has successfully completed all the six item of the test among 154 school childrens.

Table 2: Descriptive statistics of successes (S) and failure (F) in individual items of Kraus-Weber tests in each gender at different age category

| | | A+P | | A-P | | P | | UB | | LB | | F | |
		S	F	S	F	S	F	S	F	S	F	S	F
11yr.	B	14	01	12	03	15	0	15	0	07	08	14	01
	G	20	01	16	05	21	0	21	0	14	07	21	0
	T	34	02	28	08	36	0	36	0	21	15	35	01
12yr.	B	37	01	33	05	35	03	38	0	35	03	37	01
	G	26	01	23	04	26	01	27	0	22	05	27	0
	T	63	02	56	09	61	04	65	0	57	08	64	01
13yr.	B	27	0	26	01	24	03	27	0	24	03	24	03
	G	10	04	08	06	14	0	14	0	12	02	14	0
	T	37	04	34	07	38	03	41	0	36	05	38	03
14yr.	B	08	0	07	01	08	0	08	0	08	0	08	0
	G	04	0	03	01	04	0	04	0	04	0	04	0
	T	12	0	10	02	12	0	12	0	12	0	12	0
Total	B	86	02	78	10	82	06	88	0	74	14	83	05
	G	60	06	50	16	65	01	66	0	52	14	66	0
	T	146	08	128	26	147	07	154	0	126	28	149	05

The table no. 02 reveals that the success rate in all six test item according to the age and gender of the childrens in which test item 1 age category of 11yr total 94.44% (93.33% boys and 95.23% girls) get success in completing the test item, in age category of 12yr total 96.92% (97.36% boys and 96.29% girls) get success in completing the test item no.1, in age category of 13yr total 90.24% (100% boys and 71.43% girls) get success in completing the test item no.1, in age category of 14yr 100% success rate in both gender in completing the test item no.1, whereas in test item 2 age category of 11yr total 77.77% (80% boys and 76.19% girls) get success in completing the test item, in age category of 12yr total 86.15% (86.84% boys and 85.18% girls) get success in completing the test item no.2, in age

category of 13yr total 82.92% (96.29% boys and 57.14% girls) get success in completing the test item no.2, in age category of 14yr total 83.33% (87.5% boys and 75% girls) get success in completing the test item no.2, in test item 3 age category of 11yr 100% success rate in both gender in completing the test item, in age category of 12yr total 93.84% (92.10% boys and 96.29% girls) get success in completing the test item, in age category of 13yr total 92.68% (88.88% boys and 100% girls) get success in completing the test item, in age category of 14yr 100% success rate in both gender in completing the test item, in test item 4 all age category from 11yr-14yr get 100% success rate in both gender in completing the test item, in test item 5 age category of 11yr total 58.33% (46.66% boys and 66.66% girls) get success in completing the test item, in age category of 12yr total 87.69% (92.10% boys and 81% girls) get success in completing the test item, in age category of 13yr total 81.80% (88.88% boys and 85.71% girls) get success in completing the test item, in age category of 14yr 100% success rate in both gender in completing the test item, in test item 6 age category of 11yr total 97.22% (93.33% boys and 100% girls) get success in completing the test item, in age category of 12yr total 98.46% (97.36% boys and 100% girls) get success in completing the test item, in age category of 13yr total

92.68% (88.88% boys and 100% girls) get success in completing the test item, in age category of 14yr 100% success rate in both gender in completing the test item.

Table 3: Descriptive statistics with respect to gender of successes and failure

Gender	Kraus- Weber test		
	S	F	Total
Male	58	30	88
Female	42	24	66
Total	100	54	154

α >0.05 (insignificant) α = 0.076, χ2 (1)= 3.143

The table no. 03 reveals that the total 64.93% children get success whereas total 35.06% get failure, 65.90% boys successfully completed the all six test items but 34.09% boys get failed to compete all the six items and in case of girls 63.63% girls get success but 36.36% girls get failed in clearing all the six item of the test. Since the p-value is greater than our chosen significance level (α = 0.05), we do not reject the null hypothesis. Rather, we conclude that there is not enough evidence to suggest an association between gender and minimum muscular fitness. Hence, There is no significant association as α >0.05, χ2 (1) = 3.143, α = 0.076 found between gender and minimum muscular fitness.
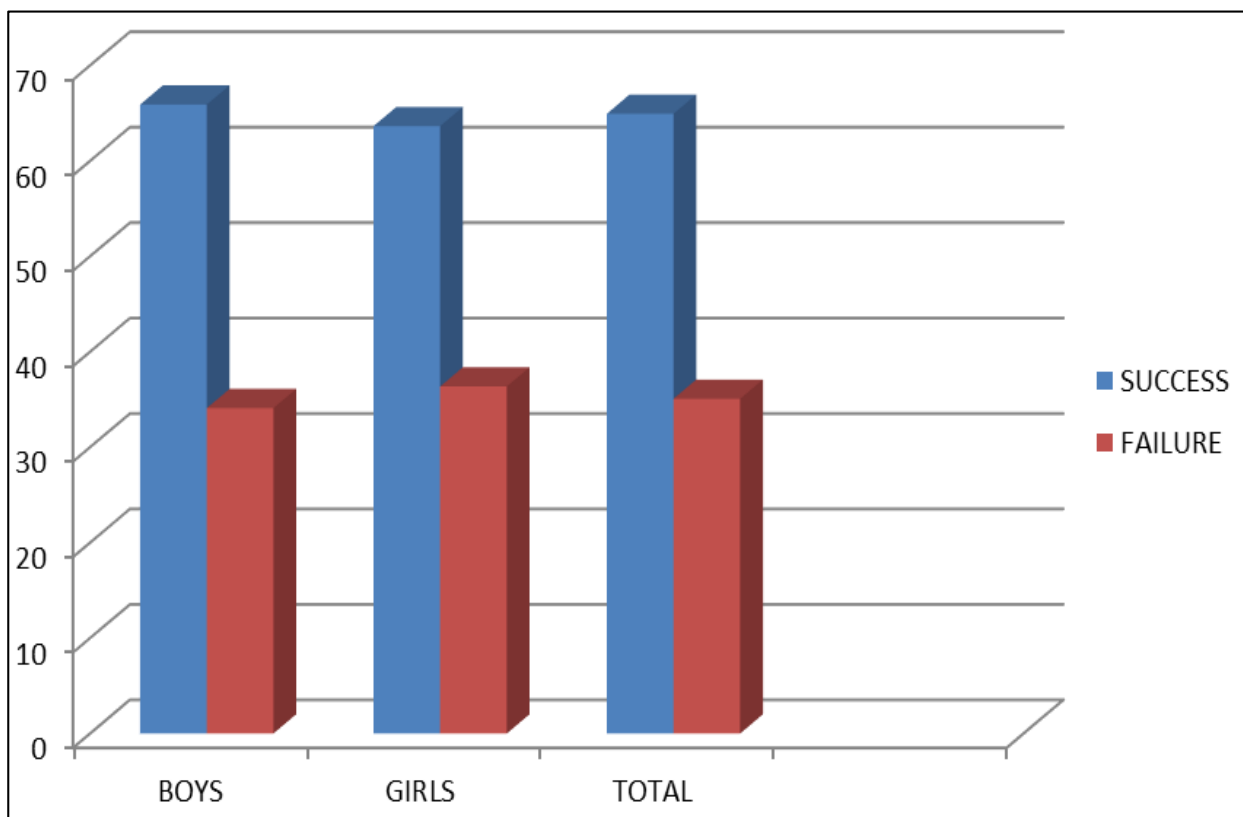

Fig 1: Graphical representation of percentage of successes and failure in respect to gender

Table 4: Descriptive statistics with respect to age of successes and failure

Age	Kraus- Weber tests		
	S	F	Total
11yr.	17	19	36
12yr.	46	19	65
13yr.	27	14	41
14yr.	10	02	12
Total	100	54	154

α < 0.01(significant) α = 0.00, χ2 (3)= 36.805

The table no.4 reveals that the success and failure of 11yr boys and girls has been 47.22% and 52.77% respectively, same in 12yr. 70.76% boys and 29.23% girls, in 13yr. 65.85% boys and 34.14% girls and in 14yr 83.33% boys and 16.66% girls get success and failure respectively in completing the Kraus -Weber test items. Here α -value < 0.01, χ2 (3) = 36.805, hence the null hypothesis is rejected and it is concluded that there is a statistically significant association between the age groups (11yr-14yr) and the minimum muscular fitness.
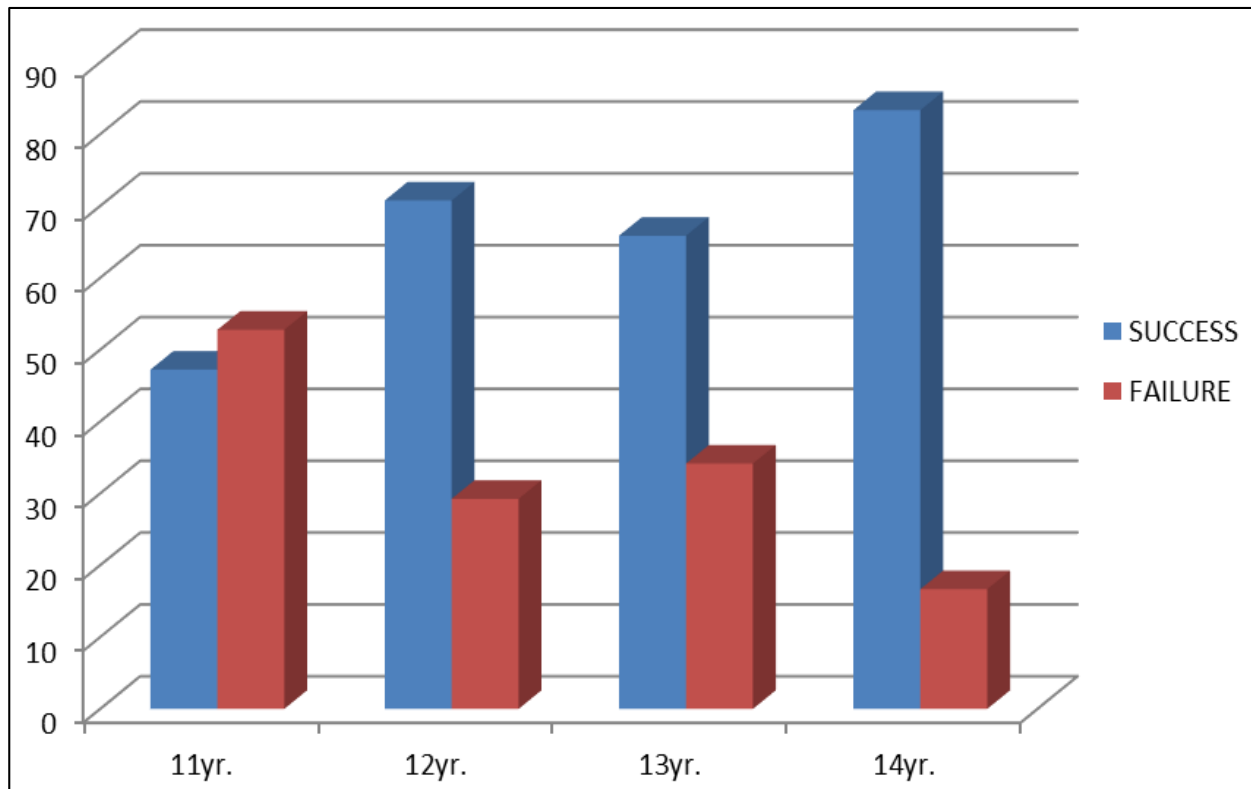
Fig 2: Graphical representation of percentage of successes and failure in respect to age

Discussion and Conclusion

As a result the finding states that the value of chi-square is a statistically significant association between the age groups (11yr-14yr) and the minimum muscular fitness. It is clearly shown in the study that as the age get increases the percentage of success increases and percentage of failure decreases. This is may be because of the physiological and even psychological effects because as child grow up they get increase their muscle size and mentally also they are more confident and mature to perform the test item. Marjorie Phillips *et al*., (1955) [3] states that for both sexes, there is a decided decrease in strength item failure as age increases. By the time the children are 11 years of age the percentage of failure on any item is less than 8 per cent, and agrees very closely with the results found for European children. Dr. SD Kulkarni *et al*., (2010) [4] states that healthy school-going children of Age 10 years have been found to have the highest percentage of failures in Kraus-Weber Tests followed sequentially by Ages 12, 11 and 9 years. This most probably is a consequence of hormonal changes taking place in the body during this phase of life.

The result of the study also shows that the girls percentage of successfully completion of minimum muscular fitness is higher than boys in the age 11yr. and 12yr. this is may be due to the puberty period of girls because girls usually get their puberty in the year of 11 -12 years and at that time girls having hormonal change which increase their physiological capacities more than the boys. Glenn Kirchner *et al*., (1957) [2] states that the flexibility item not only accounted for the greatest number of these failures, but at every age level caused the girls to appear more "muscularly fit" than the boys. Girls are substantially superior to boys at all levels in passing the Test, and in flexibility. Doris Buxton, (1957) [1] has also stated in his research that the results indicate that strength and flexibility differ with age and sex and that the standards, even though considered minimal, should also vary with the different ages and sex groups. Whereas in the 13yr. and 14yr. of boys and girls, boys percentage of successfully completion of minimum muscular fitness is higher than girls rather, in whole as age group 11-14yrs. Here this is may be because as girls get their puberty same boys also get this but later than girls so at this point when boys get the puberty period they become more physiological and muscular capable than girls. Therefore, there is no significant association was found between gender and minimum muscular fitness. And we conclude that there is not enough evidence to suggest an association between gender and minimum muscular fitness. Therefore it concluded that in the selected children of the study minimum muscular fitness is not significantly associated with gender but the minimum muscular fitness is significantly associated to the age of the children.

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