

Research Paper :

Construction of norms for strength and cardio-vascular tests of school children

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ABSTRACT

The purpose of the study was to construct the norms for strength and cardio-vascular tests of school children. 2000 male students studying in classes 9th to 12th in various Senior Secondary Schools from 10 districts of Uttar Pradesh were selected to serve as subjects. The study was confined to the norms of arm strength, back strength, leg strength and abdominal strength (for strength variable) and cooper's 12 minute run/walk and Gallagher and Brouha step test (for cardio-vascular efficiency test). Arm Strength was scored according to the Roger's formula (Pull-ups + Push-ups) (W/10+H-60). Abdominal strength was measured by sit-ups, Back and leg strength were measured with the help of Dynamometer and for the measurement of cardio-vascular efficiency Gallagher and Brouha step test and 12 minute run/walk Cooper test were applied. For the purpose of the study the 'Difficulty Rating Scale' (statistical technique) was applied to construct the norms.

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Developing an individual's physical fitness is one of the major objectives of the process of physical education (Barrow and Mc Gee, 1979; Johnson and Nelson, 1988). Physical fitness is one of the potential characteristics of every human being, physically fit citizens are the major asset for a strong nation and hence physical fitness of the youth should be a national concern. Children's physical fitness is of interest to educate us as it improves health and prevent disease. The promotion of strength and cardio-respiratory fitness through increased physical activity has become a national priority. The field of physical education has been identified as an important vehicle for achieving these objectives in children (Hastad and Lacy, 1994). For the purpose of this study strength is considered as the ability of a muscle or a group of muscles to exert force against resistance and cardio-vascular efficiency is considered as the ability of the cardio-respiratory system to sustain a work for prolonged period of time.

Main objective of this study is to construct norms for strength and cardio-vascular tests of school children. The study has been confined to the norms of arm strength, back strength, leg strength and abdominal strength (for strength variable) and Cooper's 12 minute run/walk and Gallagher and Brouha step test (for cardio-vascular

efficiency test).

METHODOLOGY

2000 male students studying in classes 9th to 12th in various Senior Secondary Schools from 10 districts of Uttar Pradesh were selected randomly to serve as subjects. The selected schools and subjects pertaining to the same has been presented in Table 1.

For selecting the subjects, the names of all the subjects were taken from the records of their respective schools. All the schools principals were requested through a common circular to render their help to the research scholar. Prior to the administration of tests, a meeting of all the subjects was held and requirement of the testing procedure was explained to them so there was no ambiguity in their minds regarding the efforts required of them. Demonstration of all seven tests items included in the present study was given. The rules and patterns of scoring governing each test items were also fully explained. All the test items were administered in the school hours from 11:00 AM to 4:00 PM. On the first day of the test, all the subjects were assembled and each test item was demonstrated and its requirements and purpose was explained. The height and weight were measured without wearing shoes. The subjects were given sufficient

Table 1: Selection of subjects from senior secondary schools of 10 districts of Uttar Pradesh

Sr. No.	District	Name of the school	No. of students
1.	Agra	St. Clares Senior Secondary School	100
		Army School	100
2.	Bijnore	Dayawati Dharamveeram Public School	100
		Raja Harbans Singh Inter College	100
3.	Bulandshahr	Khalsa Public School	100
		D.A.V. Inter College	100
4.	Ghaziabad	J.K.G. School	100
		Dehradun Public School	100
5.	Firozabad	S.R.K. Inter College	100
		Kasturba Inter College	100
6.	Muzaffarnagar	S.D. Public School	100
		Stepping Stone School	100
7.	Saharanpur	Government Inter College	100
		Gurunanak Inter College	100
8.	Meerut	Central School Dogra Regiment	100
		Dev Nagri Inter College	100
9.	Mathura	Central School Mathura Cantt.	100
		Deen Dayal Public School	100
10.	Mainpuri	Janta Inter College	100
		Christian Inter College	100

time for warming up before the conducting of the tests. Six test items: Pull-Up, Push-Up, Sit-Up, Leg strength test, Back strength test and Gallagher and Brouha step test were conducted on the first day and seventh test item: Cooper's 12 minute run/walk test was conducted on the second day.

Arm strength was scored according to the Roger's formula (Pull-ups + Push-ups) (W/10+H-60). Abdominal strength was measured by sit-ups; Back and Leg strength were measured with the help of Dynamometer and for the measurement of Cardio-vascular efficiency Gallagher and Brouha step test and 12 minute run/walk Cooper test, respectively were applied.

OBSERVATIONS AND DISCUSSION

In order to construct the norms for strength and cardio – vascular efficiency tests of school children, difficulty rating scale was applied and the results pertaining to this has been presented in Tables 2 to 7.

Norms for the arm strength in terms of difficulty rating scale are presented in Table 2.

A study of Table 2 reveals that in arm strength for 9th to 12th classes boys the highest performance score

Table 2: Difficulty rating scale for arm strength

Difficulty rating score	Test score (Pounds)
100	675
90	630
82	585
74	540
66	495
58	450
51	405
44	360
37	315
30	270
24	225
18	180
13	135
8	90
3	45

Mean = 190, S.D. = 122.8, N = 2000

was 675 pounds and lowest score was 45 pounds. The difficulty rating scale has been graphically exhibited in Fig. 1.

Norms for abdominal strength in terms of weighted scale are presented in Table 3.

A study of Table 3 reveals that in abdominal strength for 9 to 12th classes' boys, the highest performance score was 65 and lowest score was 5. The difficulty rating scale has been graphically exhibited in Fig. 2.

Norms for leg strength in terms of weighted scales presented in Table 4.

A study of Table 4 reveals that in Leg Strength for

Table 3: Difficulty rating scale for abdominal strength (SIT-UPS)

Difficulty rating score	Test score (No. of Sit-Ups)
100	65
88	60
77	55
66	50
57	45
48	40
39	35
32	30
24	25
18	20
12	15
7	10
3	5

Mean = 29, S.D. = 10.63, N = 2000

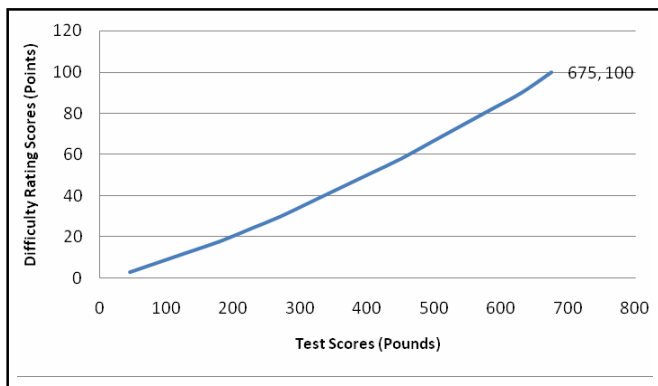


Fig. 1: Difficulty rating scale for arm strength

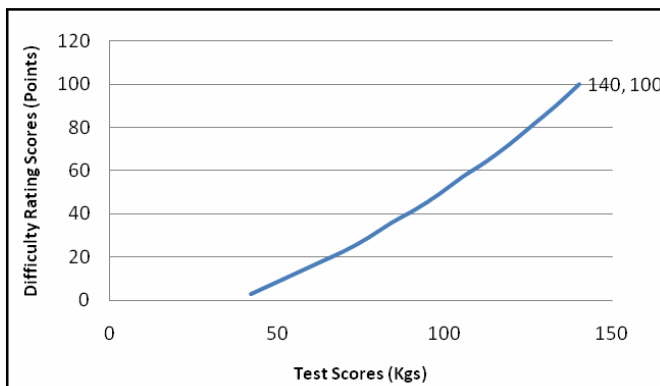


Fig. 3: Difficulty rating scale for leg strength

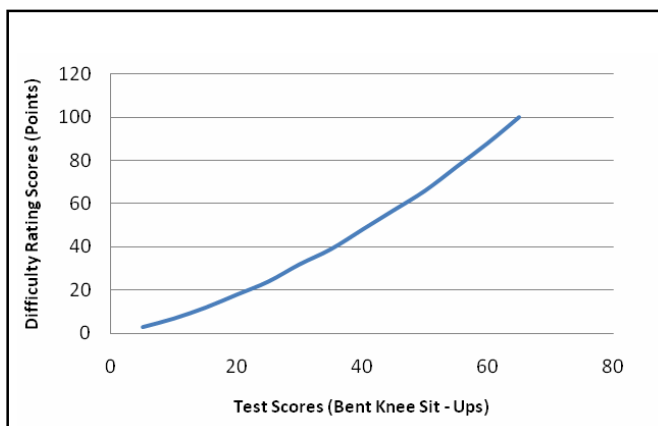


Fig. 2: Difficulty rating scale for abdominal strength

Scale are presented in Table 5.

A study of Table 5 reveals that in Leg Strength for 9th to 12th classes of boys, the highest performance score was 135 and lowest score was 37. The difficulty rating scale has been graphically exhibited in Fig. 4.

Table 4: Difficulty rating scale for leg strength	
Difficulty rating score	Test scores (kg)
100	140
90	133
81	126
72	119
64	112
57	105
49	98
42	91
36	84
29	77
23	70
18	63
13	56
8	49
3	42

Mean = 75, S.D. = 21.14, N = 2000

9th to 12th classes of boys, the highest performance score was 140 and lowest score was 42. The difficulty rating scale has been graphically exhibited in Fig. 3.

Norms for back strength in terms of Difficulty Rating

Table 5: Difficulty rating scale for back strength	
Difficulty rating score	Test scores (kg)
100	135
90	128
80	121
72	114
63	107
55	100
48	93
41	86
34	79
28	72
22	65
16	58
11	51
7	44
3	37

Mean = 72, S.D. = 19.27, N = 2000



Fig. 4: Difficulty rating scale for back strength

Norms for Cooper’s 12 minute run / walk test in terms of weighted scale is presented in Table 6.

A study of Table 6 reveals that in Cooper’s 12 minute run / walk test for 9th to 12th classes of boys, the highest performance score was 3150 and lowest score was 1350.

Difficulty rating score	Test scores (Yards)
100	3150
88	3000
77	2850
67	2700
58	2550
49	2400
41	2250
33	2100
25	1950
19	1800
13	1650
8	1500
4	1350

Mean = 2185, S.D. = 388.48, N = 2000

The weighted norms have been graphically exhibited in Fig. 5.

Norms for the Gallagher and Brouha Step Test in terms of weighted scale are presented in Table 7.

A study of Table 7 reveals that in Gallagher and Brouha Step Test for 9th to 12th classes of boys, the highest performance score was 90 and lowest score was 48. The difficulty rating scales have been graphically exhibited in Fig. 6.

The above mentioned strength and cardio-vascular norms for Senior Secondary School boys of ten districts

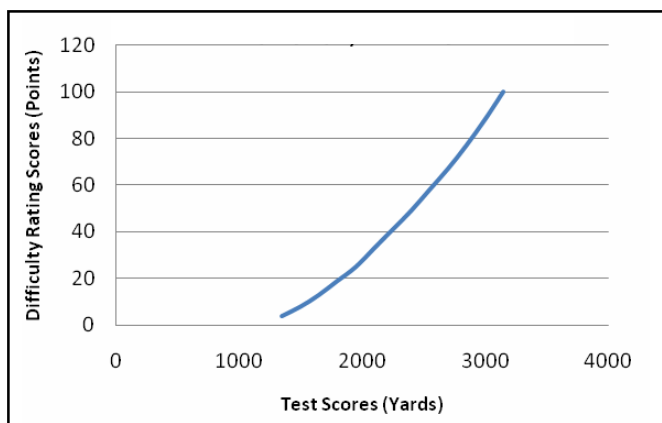


Fig. 5: Difficulty rating scale for cooper's 12 minutes run/walk test

Table 7 : Difficulty rating scale for Gallagher and brouha step test

Weighted score	Test score (P.E.I)
100	90
90	87
81	84
72	81
64	78
56	75
49	72
41	69
35	66
28	63
22	60
16	57
11	54
06	51
02	48

Mean = 63, S.D. = 9.11, N = 2000

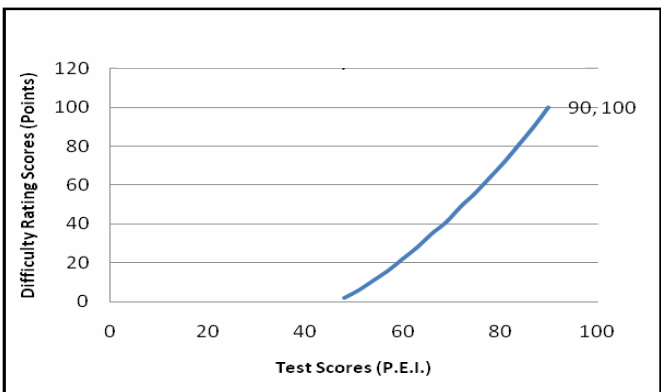


Fig. 6: Difficulty rating scale for cooper's 12 minutes run/walk test

of Uttar Pradesh, studying in classes 9th to 12th have been prepared on the basis of tests and measurement applied on 2000 students and with the use of Difficulty Rating Scale.

Marking pattern in the difficulty rating scale is based upon difficulty rating of the performance. More effort is required to improve the performance at the higher level in comparison of the same degree of improvement at the lower level. Thus, a student could be rewarded more at the higher level for slight improvement than that of at the lower level with same improvement. It is expected that with the passage of time, higher performance may be expected from the school. Students keep this aspect in mind and the research scholar has prepared difficulty rating scale norms. This scale facilitates assigning grades for better performance expected in future.

The highest scores for arm strength in difficulty rating

scale was 675 whereas, the lowest performance in arm strength was 45. The highest score in the difficulty rating scale for abdominal strength was 65 and lowest score in was 5. The highest score in leg strength was 140 and the lowest score 42 in difficulty rating scale. The difficulty rating scale for back strength showed the highest score 135 and the lowest score 37. The highest score for Cooper's 12 minute run / walk test in difficulty rating scale was 3150 whereas the lowest performance in Copper's 12 minute run / walk test was 1350 and lastly the difficulty rating scale for Gallagher and Brouha step test showed the highest score 90 and the lowest score was 48.

Conclusions:

On the basis of the findings of study the following conclusions were made:

- The difficulty rating scale for different tests of strength and cardio-vascular efficiency have been constructed for male students studying in classes 9th to 12th of Senior Secondary schools from 10 districts of Uttar Pradesh.

- Strength and cardio-vascular endurance test was employed on 2000 male subjects.

- The norms were prepared by using difficulty rating scale techniques analyzed through Microsoft Excel Package, version 2000 because it was liked to be most reliable and accurate for the purpose of the study.

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