



Research Article

## Comparative Analysis of Arm Strength Among Students from Rural, Semi-Urban, Urban Schools

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### Abstract

This study compared the arm strength of students studying in rural, semi-urban, and urban schools. A total of 275 subjects (boys and girls) were selected for this study from the age group of 11 to 13 years. The Takei Digital hand grip Dynamometer used as a testing tool. Results: The calculated t-value as follow for boys (G1 = 0.193, G2 = 0.873, G3 = 0.133) and girls (G1 = 0.180, G2 = 0.494, G3 = 0.245) less than the table value at the 0.01 level. Conclusion: - There is no significant difference between the school students (girls and boys) in term of arm strength ( $p < 0.01$ ). The analysis of the study revealed no difference in arm strength among school students.

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**KEYWORDS:** physical fitness, arm strength, hand grip strength, school students, rural, semi-urban, urban, girls & boys.

## 1. INTRODUCTION

Children's and adolescents' growth, progression, and functional ability are strongly influenced by their muscle strength which is well known as a key element of health-related fitness. Student's overall state of health, engagement in physical activities, and motor development all enhanced when they have adequate power in their muscles during their school years. Among the multiple components of muscular fitness, Arm strength is considered an important indicator of upper-body muscular capability, which required for performing actions that involve pulling, pushing, lifting, and throwing movements.

The functional efficiency of one's upper-extremity muscles, which includes the triceps, biceps, and associated forearm muscles, is reflected in arm strength. Tests of arm strength are generally performed within schools in the context of physical education and sports science research to evaluate the muscle fitness of students and to monitor their physical development. In present studies, a widely used procedure for measuring arm strength is by means of hand grip strength the grip strength dynamometer has been used. This equipment has been widely used in school based physical fitness assessments and for research purpose because it provides quick, reliable way to measure upper-extremity muscle power.

School-age students' level of their physical fitness is often shown to be highly affected by their socioeconomic background and demographic conditions. Their different lifestyle, frequent physical activity, recreational opportunities, social and cultural varied factors might be affecting the development process of muscular strength. Usually, we see that in rural environment peoples get greater opportunities for outdoor activities, whereas in urban is often linked to relatively somewhat passive living simply because of higher educational responsibilities and technological advancements.

Current researches emphasize on physical fitness assessment in school populations, but comparative studies examining variations in arm strength among students from rural, semi-urban, and urban schools are limited. Therefore, the present study aims to assess and compare the arm strength of school students studying in rural, semi-urban, and urban schools using the grip strength dynamometer. The findings of this study may

provide useful insights into the influence of environmental settings on upper-body muscular strength and contribute to the development of effective physical education and fitness promotion strategies for school-aged children.

Additionally, despite the attention on physical fitness evaluation in school population, comparative research studies examining the differences in arm strength between students from rural, semi-urban and urban schools are lacking. This research study uses a hand grip strength dynamometer to evaluate and compare the arm strength among school students.

Evaluated grip strength and gender disparities among rural urban Indian children in age group of 9 to 18 years. This was a multicentre, cross-sectional school-based study ( $n = 1978$ , mean age  $13.3 \pm 2.2$  y) from three urban and rural states. Anthropometry, body composition, dietary intake, physical activity sunlight exposure, and grip strength (in kg) were measured. These findings showed Mean grip strength increased with age but plateaued in girls after 12 y and was higher in boys ( $19.6 \pm 9.2$ ) than girls ( $14.3 \pm 5.3$ ) ( $p < 0.05$ ). Mean grip strength was higher in urban ( $21.05 \pm 9.7$ ) than in rural boys ( $17.8 \pm 8.2$ ) ( $p < 0.05$ ), and comparable in urban ( $14.9 \pm 5.2$ ) and rural girls ( $13.8 \pm 5.5$ ) Sonal Kasture Palande et. al (2022). Examined the leg back, and grip strength and cardiovascular efficiency of high school girls from rural and urban areas. Cardiovascular efficiency measure by Harvard step test and by the dynamometer leg back strength and grip strength was measured findings showed better cardio vascular and hand grip strength in urban high school girls as compare to rural girls and on the other side leg-back strength of rural high school girls was better to urban girls but the results were not statistically significant. **Biradar. C.B et al. (2021)**

## 2. METHODOLOGY AND PROCEDURE

### SELECTION OF SUBJECTS

Random sampling method has been used for data collection. A total of 275 subjects, boys and girls, were selected from the rural, semi-urban, and urban schools' students from the age group of 11 to 13 years.

**Table 3.1** Categorisation of Subjects

S. No.	Name of school	Rural	Semi urban	Urban
1	MALES	26	64	27
2	FEMALES	26	55	14
	<b>TOTAL</b>	<b>52</b>	<b>119</b>	<b>41</b>

**Table 3.2** Details of schools

S.NO.	Name of the School	Male	Female	Total No. of Subjects
1	Government Khalsa School, Sunheri, Kurukshetra	26	26	52
2	SBM Gita boys, Kurukshetra	64	00	64
3	Gita girls, Kurukshetra	00	55	55
4	Som convent gurukul, Kurukshetra	27	14	41

**Tool used for collection of data:** Dependent Variable Arm Strength of the subjects was measured using the Takei Digital Hand Grip Dynamometer, made in Japan



**Procedure for data Collection of Arm Strength:** researcher provide short and quick overview about the equipment to the subjects then showed them how to place the hand to hold the equipment and explain the process, subjects have to sit or stand with shoulder adducted, their elbow should be flexed at 90 degrees, and forearm and wrist stayed neutral then instruct the samples to squeeze as tightly as they able after grasping the dynamometer in their palm and gently holding its base free from sudden jerking allow the wrist to extend during the grip.

**Procedure for the Collection of Data:**

The investigator visited the following schools as mentioned in Table 3.2 to collect data.

**ANALYSIS OF DATA AND FINDINGS**

The data was collected with the help of different means in according to the objectives of the study, reliable, validated, and accurate they may be getting raw but. These needs were met by systematisation and organisation of data i.e. editing, classification and tabulation which help in analysing the data before it can serve any worthwhile purpose. Hence the present chapter is devoted to the description, interpretation, and analysis of data.

**Table 4.1:** Descriptive Statistics of Arm Strength Among Male Subjects of Various Schools

S.NO	GROUP'S	NUMBER	MEAN	MAX	MIN	RANGE	S. D	KURT	SKEW
1	Rural	26	17.73	29.95	6.4	23.55	6.41	-0.55	0.49
2	Semi urban	64	19.39	35.65	11.5	24.15	4.82	1.71	1.12
3	Urban	27	19.55	26.45	15.6	10.85	3.18	-0.32	0.70

**Description and Interpretation of Table-4.1:** In the table 4.1 descriptive statistics of arm strength of male subjects from rural schools has been presented. In the table 4.1(1) the mean value of arm strength of rural school students was 17.73 with S.D 6.41. The maximum & minimum value of rural school students was 29.95 & 6.4 respectively with range 23.55. Range of standard error of skewness for N=26 is -0.34 to 0.34. Now the calculated value of skewness i.e. 0.49, which is more than the range, hence the data was not normally distributed. The calculated value of kurtosis is less than from 0.263; the distribution of data was Platykurtic.

In the table 4.1(2) descriptive statistics of arm strength of male subject from semi-urban school has been presented. The mean value of arm strength of semi-urban school students was 19.39 with S.D 4.82. The maximum & minimum value of semi-urban school students was 35.65 & 11.5, respectively with range

24.15. Range of standard error of skewness for N=64 is -0.24 to 0.24. Now the calculated value of skewness i.e. 1.12, which is more than the range, hence the data was not normally distributed. The calculated value of kurtosis is more than from 0.263, the distribution of data was Leptokurtic.

In the table 4.1(3) descriptive statistics of arm strength of male subjects of urban school has been presented. The mean value of arm strength of urban school students was 19.55 with S.D 3.18. The maximum & minimum value of urban school students was 26.45 & 15.6 respectively with range 10.85. Range of standard error of skewness for N=27 is -0.34 to 0.34. Now the calculated value of skewness i.e. 0.70, which is between the range, hence the data was normally distributed. The calculated value of kurtosis is less than from 0.263; the distribution of data was Leptokurtic.

**Table 4.2:** Descriptive Statistics of Arm Strength Among Female Subjects of Various Schools

S.NO	GROUP'S	NUMBER	MEAN	MAX	MIN	RANGE	S. D	KURT	SKEW
1	Rural	26	14.66	19.8	7.45	12.35	3.65	-1.03	-0.24
2	Semi urban	55	15.68	25.75	9.3	16.45	3.65	0.12	0.54
3	Urban	14	16.47	25.7	9.75	15.95	4.60	0.25	0.86

**Description and Interpretation of Table-4.2:** In the table 4.2 descriptive statistics of arm strength of Female subjects of rural school students has been presented. In the table 4.2.(1) the mean value of arm strength of rural school students was 14.65 with S.D 3.65. The maximum & minimum value of rural

school students was 19.8 & 7.45. respectively with range 12.35. The range of the standard error of skewness for N=26 is -0.34 to 0.34. Now the calculated value of skewness i.e., -0.24, is between the range, hence the data was normally distributed. The calculated value of kurtosis is less than from 0.263; hence

the distribution of data was Platykurtic. In the table 4.2(2) descriptive statistics of arm strength of Female subjects of semi-urban schools has been presented. The mean value of arm strength of semi-urban school students was 15.68 with S.D 3.65. The maximum & minimum value of semi-urban school students was 25.75 & 9.3 respectively with range 16.45. Range of standard error of skewness for N=55 is -0.24 to 0.24. Now the calculated value of skewness i.e. 0.54, which is more than the range, hence the data was not normally distributed. The calculated value of kurtosis is less than from 0.263; hence the distribution of data was Platykurtic.

In the table 4.2(3) descriptive statistics of arm strength of Female subjects of urban school students has been presented. The mean value of arm strength of urban school students was 16.47 with S.D 4.60. The maximum & minimum value of urban school students was 25.7 & 29.75 respectively with range 15.95. Range of standard error of skewness for N=14 is -0.58 to 0.58. Now the calculated value of skewness i.e. 0.86, which is between the range, hence the data was normally distributed. The calculated value of kurtosis is less than from 0.263; hence the distribution of data was Platykurtic.

**Table 4.3:** Comparative analysis of Mean scores of Arm Strength for Male Subjects of various schools, i.e. Rural, Semi-urban, and Urban

S.NO	GROUP	MEAN 1	MEAN 2	M.D.	S.D 1	S.D 2	S.E.D	T- VALUE
1	Rural vs. semi-urban	17.73	19.55	1.82	6.41	3.18	1.40	0.193149
2	Semi-urban vs urban	19.55	19.39	0.16	3.18	4.82	0.85	0.873781
3	Urban vs Rural	19.39	17.73	1.66	4.82	6.41	1.39	0.183094

\*\* - Significant at 0.01 level

**Description and interpretation of the table no. 4.3:**

According to the table 4.3.1 the mean value of arm strength present in the male subjects studying in rural school was 17.73 and semi-urban school students was 19.55 Their mean difference value was 1.82. The standard error of difference was 1.40. The calculated t value was 0.19, which is less than the table value at 0.01 levels (df – 51, 2.66). It reflects that there was no significant difference in the arm strength of male subjects from rural and Semi-urban school. Hence, the hypothesis no.1 is accepted.

**Description and interpretation of table no. 4.3:** According to the table 4.3.2 the mean value of arm strength present in the male subjects studying in semi-urban school was 19.55 and urban school students was 19.39 Their mean difference value was 0.16. The standard error of difference was 0.85. The calculated t value was 0.87, which is less than the table value at 0.01 levels (df – 89, 2.63). It reflects that there was no

significant difference in the arm strength of male subjects of semi-urban and urban school. Hence, the hypothesis no.1 is accepted.

**Description and interpretation of table no. 4.3:** According to the table 4.3.3 the mean value of arm strength present in the male subjects studying in urban school was 19.39 and rural school students was 17.73 Their mean difference value was 1.66. The standard error of difference was 1.39. The calculated t value was 0.18, which is less than the table value at 0.01 levels (df – 88, 2.63). It reflects that there was no significant difference in the arm strength of male subjects studying in urban and rural school. Hence, the hypothesis no 1 is accepted.

**Comparative analysis of Mean scores of Arm Strength of female Subjects from various schools i.e. Rural, Semi-urban, and Urban**

**Table - 4.4**

S.NO	GROUP	MEAN 1	MEAN 2	M.D.	S.D 1	S.D 2	S.E.D	T- VALUE
1	Rural vs. semi-urban	14.66	16.47	1.81	3.65	4.60	1.42	0.180321
2	Semi urban vs urban	16.47	15.68	0.79	4.60	3.65	1.32	0.494381
3	Urban vs Rural	15.68	14.66	1.02	3.65	3.65	0.86	0.245659

\*\* -Significant at 0.01 level

**Description and interpretation of table no. 4.4:** According to the table 4.4.1 the mean value of arm strength present in the female subject studying in rural school was 14.66 and semi urban school students was 16.47 Their mean difference value was 1.81. The standard error of difference was 1.42. The calculated t value was 0.18, which is less than the table value at 0.01 levels (df – 38, 2.70). It reflects that there was no

significant difference in the arm strength of female subjects studying in Rural and Semi urban school. Hence, hypothesis no.1 is accepted.

**Description and interpretation of table no. 4.4:** According to the table 4.4.2 the mean value of arm strength present in the female subjects studying in semi-urban school was 16.47 and

urban school students was 15.68 Their mean difference value was 0.79. The standard error of difference is 1.32. The calculated t value was 0.49, which is less than the table value at 0.01 levels (df – 67, 2.65). It reflects that there was no significant difference in the arm strength of female subjects studying in semi-urban and urban school. Hence, the hypothesis no.1 is accepted.

**Description and interpretation of table no. 4.4:** According to the table 4.4.3 the mean value of arm strength present in the female subjects studying in urban school was 15.68 and rural school subjects was 14.66 Their mean difference value was 1.02. The standard error of difference was 0.86. The calculated t value was 0.25, which is less than the table value at 0.01 levels (df – 79, 2.64). It reflects that there was no significant difference in the arm strength of female subjects studying in urban and rural school. Hence, the hypothesis no.1 is accepted.

### CONCLUSIONS AND SUMMARY

In the male category no significant difference has been found in the Arm strength of subjects from rural, semi-urban, urban Schools.

Similarly, In the female category no significant difference has been found in the Arm strength of subjects studying in rural, semi-urban, urban Schools.

### REFERENCE

- Kryeziu AR, Iseni A. Differences between children's anthropometric and physical fitness in urban and rural areas. *Sports Sci Health Apeiron*. 2022;12(2):120–126. doi:10.7251/SSH2202120K.
- Kamdar A, Prajapati H. Level of physical activity in rural and urban elementary school children: an observational study. *Int J Phys Educ Sports Health*. 2021;8(3). doi:10.22271/kheljournal.2021.v8.i3e.2097.
- Dar AA, Dar SA, Khan MA. Comparative study of selected physical fitness components among rural and urban school boys. *JETIR*. 2020;7(12).
- Kumar A, Kumar V. Comparison of physical fitness components between urban and rural school-going female students. *Yoga*. 2019;4(1):885–886.
- Cumbreras AC, Sanchez AL, Sanchez MLZ. Analysis and evaluation of the fitness of primary school students in rural and urban areas. 2014;116(1):44–51.
- Namjoo A, Mogharnasi M, Asad Manesh E. Comparison of physical fitness-related factors between urban and rural students. *Res Article*. 2012;2(5).
- Sylejmani B, Myrtaj N, Maliqi A. Physical fitness in children and adolescents in rural and urban areas. *J Hum Sport Exerc*. 2019;14(4):866–875. doi:10.14198/jhse.2019.144.15.
- Li C, Taerken AY, Li Q. Secular trends in physical fitness of rural Chinese children and adolescents aged 7–18 years from 1985 to 2019. *Sci Rep*. 2023;13:4229.
- Sonkamble C, Bankar V. Comparative study of nutritional status of urban and rural children. *Horiz Holist Educ*. 2022;9(5):27–32.
- Biradar CB. Cardiovascular efficiency and strength between rural and urban school girls. *Int J Phys Educ Sports Health*. 2021;8(3):210–211.
- Novak D, Bernstein E, Podnar H. Differences in the fitness levels of urban and rural middle school students in Croatia. *Phys Educ*. 2015;72(4):553–577. doi:10.18666/TPE-2015-V72-I4-6115.
- Appiah EJ, Moses MO, Alhaji M. Physiological, anthropometric profiles and motor performance of urban and rural primary school pupils. *Gazz Med Ital Arch Sci Med*. 2019;178(5):249–255. doi:10.23736/S0393-3660.18.03829-9.
- Pino-Ortega J, Diaz-Suarez A. Rural–urban differences in children's physical fitness. *Rev Psicol Deporte*. 2012;21(2):359–363.
- Dollman J, Norton K, Tucker GR. Anthropometry, fitness and physical activity of urban and rural South Australian children. *Pediatr Exerc Sci*. 2002;14(3):297–312. doi:10.1123/pes.14.3.297.
- Nara K, Kumar P. Normative reference values of grip strength and associated factors in Indian adolescents. *J Phys Educ Sport*. 2023;23(6):1367–1375.
- Singh K, Singh A. Comparative study of selected physical fitness variables between government and private school students of urban and rural areas. *Int J Phys Nutr Phys Educ*. 2019;4(1):2424–2427.
- Singh KM, Singh M, Singh S. Study of physical fitness among rural and urban children from Punjab. *Int J Phys Educ Sports Health*. 2016;3(3):475–478.
- Gill M, Deol NS, Kaur R. Comparative study of physical fitness components of rural and urban female students of Punjabi University, Patiala. 2009. doi:10.31901/24566802.2009/12.01.03.
- Aliniya N, Hojatti Z. Comparison of physical fitness between urban and rural elementary students in Iran. *Int J Manag Humanit Sci*. 2015;4(1):4440–4443.
- Pandey P, Sharma K. Healthy living aspects in urban and rural school children through physical education learning. *Indian J Sci Technol*. 2020;13. doi:10.17485/IJST/v13i45.1966.
- Prasad D. Analysis of motor performance of rural and urban high school children. *Int J Phys Nutr Phys Educ*. 2020;5(2):133–136.
- Dhayal P, Kumar A. Study of motor fitness components of rural and urban school-going students. *Int J Phys Nutr Phys Educ*. 2019;4(1):245–247.
- Chillón P, Ortega FB, Ferrando JA. Physical fitness in rural and urban children and adolescents from Spain. *J Sci Med Sport*. 2011;14(5):417–423. doi:10.1016/j.jsams.2011.04.004.
- Palande SK, Ekbote V. Differential relationship of grip strength with body composition and lifestyle factors

- between Indian urban and rural children. *Indian J Pediatr.* 2022;89(12). doi:10.1007/s12098-022-04153-9.
25. Kumar SJ, Krishnaswamy PC. Analysis of motor abilities of rural and urban high school boys of Tumkur district. *Yoga.* 2018;3(1):998–1000.
26. Tan CH, Mahmud ZF, Choong TY. Physical fitness level between urban and rural students: a case study. *Procedia Soc Behav Sci.* 2013. doi:10.1016/j.sbspro.2013.07.160.
27. Tian Y, Liu L, Wang X. Urban–rural differences in physical fitness and out-of-school physical activity for primary school students. *Int J Environ Res Public Health.* 2021;18(20):10813. doi:10.3390/ijerph182010813.

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