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**Jaspreet Kashyap**

Research Scholar, Department of  
Physical Education, Panjab  
University Chandigarh, India

**Dr. Thingnam Nandalal Singh**

Associate Professor, Department  
of Physical Education, Panjab  
University Chandigarh, India

## Effectiveness of active transportation on muscular endurance of school boys and girls of Chandigarh

**Jaspreet Kashyap and Dr. Thingnam Nandalal Singh**

### Abstract

The purpose of the study was to compare the muscular endurance among different mode of travelling groups (motorized, cyclist and walkers) of Chandigarh school boys and girls. The study was carried out of 3000 school boys (1500) and Girls (1500) of Chandigarh. The age of the subjects ranged between 13-17 years. A survey type study had been designed to compare the muscular endurance among different mode of travelling groups of Chandigarh school boys and girls. Initially simple random sampling technique was used for the selection of schools from the government and private schools of Chandigarh. To find out the significance differences among different mode of travelling groups, analysis of variance (ANOVA) was applied with the help of SPSS software. For testing hypothesis, the level of significance was set at 0.05. Further Scheffé's Post-hoc test was applied to see the direction and significances of differences where 'F'-ratio was found significant. The findings of the study revealed that Cyclists group of school boys and girls were significantly superior to their counterparts.

**Keywords:** Transportation, muscular endurance, school students

### Introduction

Everybody is born to travel. As early as we have the strength, we are carried to many destinations by our bodies like crawling around our homes, running around the yard, walking to a house of a friend, and finally hurrying to our automobiles. At different ages, we adopt several modes to travel to various places. Still the environment in which we live is traditionally best planned for a single mode of travel and that is the automobile. This confined transportation planning vision compromises all of our travel decisions, but increasingly so for children and the caregivers who must provide them transportation to their important activities such as education and social events (Beaumont & Pianca, 2002) [4]. There is a decrease in habitual physical activity and this is suggested to be a contributing factor to rising levels of overweight and obesity in childhood, however there are limited direct data to describe how physical activity of the children has changed over recent decades. Indirect evidence for a reduction in overall physical activity comes from transportation surveys, which have recorded a decrease in the proportion of journeys taken by foot and an increase in car travel (Moller, 2009). These kind of trends are reflected in the decline in active travel to school reported in many countries. In the U.S. active commuting of children to school declined by 37% between 1977 and 1995, and current estimates suggest that around 5 to 10% of children aged 5 to 15 years walk to school with fewer than 2 to 4% cycling (Department of Transport, 1986 & 2002). This reduction has not happened in countries with a strong tradition of active commuting. In Denmark, cycling to school has not changed since 1983, with 63% of 16- to 19-year-olds cycling to school in 1986 compared with 66% of 15-year-olds in 1977 and 63% in 2003 (Sirard, 2005 & Evenson, 2008) [9, 5]. The potential opportunity to reverse the decline has gradually resulted in the journey to school receiving attention as a clear target for intervention to increase young people's daily physical activity (Cooper, 2008) [3].

### Statement of the Problem

The purpose of the study was to compare the muscular endurance among different mode of travelling groups (motorized, cyclist and walkers) of Chandigarh school boys and girls.

**Corresponding Author:**

**Jaspreet Kashyap**

Research Scholar, Department of  
Physical Education, Panjab  
University Chandigarh, India

**Method and Procedure**

A sample of 3000 school student's age ranging between 13 to 17 years studying in Chandigarh school boys and girls was taken as the subjects for this present study. Bent knee sit-up was used to measure the muscular endurance. To find out the significant differences among different mode of travelling groups (motorized, cyclist and walkers) on muscular endurance, Analysis of Variance (ANOVA) was applied with the help of SPSS software. Further Scheffe's post-hoc test

was used to see the direction and significance of differences where 'F' ratio was found significant. For testing of hypothesis, the level of significance chosen was 0.05.

**Results and Findings**

Descriptive analysis of muscular endurance (bent knee sit-ups) among different mode of travelling groups of Chandigarh school boys (13 to 17 years) have been presented in table-1.

**Table 1:** Descriptive Analysis of Muscular Endurance (Bent Knee Sit-Ups) Among Different Mode of Travelling Groups of Chandigarh School Boys

GROUP	AGE GROUPS									
	13 Years (100)		14 Years (100)		15 Years (100)		16 Years (100)		17 Years (100)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Motorised	19.99	6.52	19.91	5.03	20.33	4.63	18.66	5.03	16.17	5.24
Cyclists	26.32	8.49	29.61	17.27	33.17	5.28	33.87	7.74	26.65	5.43
Walkers	28.50	6.35	22.86	7.93	30.69	8.82	31.67	7.46	31.40	9.51

The Cyclist age group of muscular endurance of 14,15,16 years of school boys of Chandigarh was the top notch with the mean value of 29.61, 33.17, 33.87, respectively and the Cyclist group was found higher mean value to Walkers and Motorised group of Chandigarh school boys. The Walkers age group of muscular endurance of 13,

14,15,16 and 17 years of school girls of Chandigarh was the greater with the mean value 28.50, 22.86, 30.69, 31.67, 31.40 followed by the Motorised age group of Chandigarh school boys. The Motorised age group of muscular endurance of 13,14,15,16 and 17years was found minimum with mean value 19.99, 19.91, 20.33, 18.66 and 16.17 respectively.

**Table 2:** Analysis of Variance of Different Mode of Travelling Groups of Chandigarh School Boys on Muscular Endurance (Bent Knee Sit-Ups)

Age Group	Source of variance	Sum of Squares	Df	Mean Square	F-Value	Sig.
13 Years	Between Groups	3908.04	2	1954.02	37.80*	.00
	Within Groups	15351.75	297	51.68		
	Total	19259.79	299			
14 Years	Between Groups	4945.16	2	2472.58	19.17*	.00
	Within Groups	38294.02	297	128.93		
	Total	43239.18	299			
15 Years	Between Groups	9278.18	2	4639.09	109.45*	.00
	Within Groups	12587.61	297	42.38		
	Total	21865.79	299			
16 Years	Between Groups	13514.80	2	6757.40	143.80*	.00
	Within Groups	13955.86	297	46.98		
	Total	27470.66	299			
17 Years	Between Groups	12144.86	2	6072.43	123.38*	.00
	Within Groups	14616.86	297	49.21		
	Total	26761.72	299			

\*Significant at .05 level F(2, 297) = 3.03

From the result entered in the table 05 that there has been a significant difference found among various Mode of travelling groups of school boys of Chandigarh on Muscular endurance variable as the obtained F values (37.80, 19.17, 109.45, 143.80, 123.38) was found to be greater than the table value of 3.03 which was required to be significant at .05%

level. Further, Scheffe's post-hoc test of significant was applied to find out the actual significant difference on muscular endurance among different mode of travelling groups existed. The results of post hoc test of significance have been presented in table 3.

**Table 3:** Significant Difference between the Paired Means of Muscular Endurance of School Boys among Different Mode of Travelling Groups

AGE GROUP	GROUPS			MD	Sig.
	Motorised	Cyclist	Walker		
13 Years	19.99	26.32	-----	6.33*	.00
	19.99	-----	28.50	8.51*	.00
	19.99	26.32	-----	6.33*	.00
	-----	26.32	28.50	2.18	.10
	19.99	-----	28.50	8.51*	.00
	-----	26.32	28.50	2.18	.10
14 Years	19.91	29.61	-----	9.70*	.00
	19.91	-----	22.86	2.95	.18
	19.91	29.61	-----	9.70*	.00
	-----	29.61	22.86	6.75*	.00
	19.91	-----	22.86	2.95	.18

	-----	29.61	22.86	6.75*	.00
15 Years	20.33	33.17	-----	12.84*	.00
	20.33	-----	30.69	10.36*	.00
	20.33	33.17	-----	12.84*	.00
	-----	33.17	30.69	2.48*	.02
	20.33	-----	30.69	10.36*	.00
16 Years	-----	33.17	30.69	2.48*	.02
	18.66	33.87	-----	15.21*	.00
	18.66	-----	31.67	13.01*	.00
	18.66	33.87	-----	15.21*	.00
	-----	33.87	31.67	2.20	.07
17 Years	18.66	-----	31.67	13.01*	.00
	-----	33.87	31.67	2.20	.07
	16.17	26.65	-----	10.48*	.00
	16.17	-----	31.40	15.23*	.00
	16.17	26.65	-----	10.48*	.00
	-----	26.65	31.40	4.75*	.00
	16.17	-----	31.40	15.23*	.00
	-----	26.65	31.40	4.75*	.00

\*The mean difference is significant at the 0.05 level

The result of Scheffe’s post-hoc test related to muscular endurance variable at all the three different mode of travelling groups indicated that the Cyclists group of Chandigarh school boys were significantly stronger than the Walkers and Walkers further found superior to Motorised group because of masculine factor which was developed due to the use of manual transport system to and fro school. The mean

difference of muscular endurance is 6.33, 8.51 (13 years), 9.70, 6.75 (14 years), 12.84, 10.36, 2.48, (15years), 15.21, 13.01 (16 years), 10.48, 15.23, 4.075(17years) between scores pertaining to muscular endurance were found higher than the critical ratio of .00, and .02. Mean scores of different mode travelling groups of Chandigarh school boys on muscular endurance are depicted graphically in figure-1.

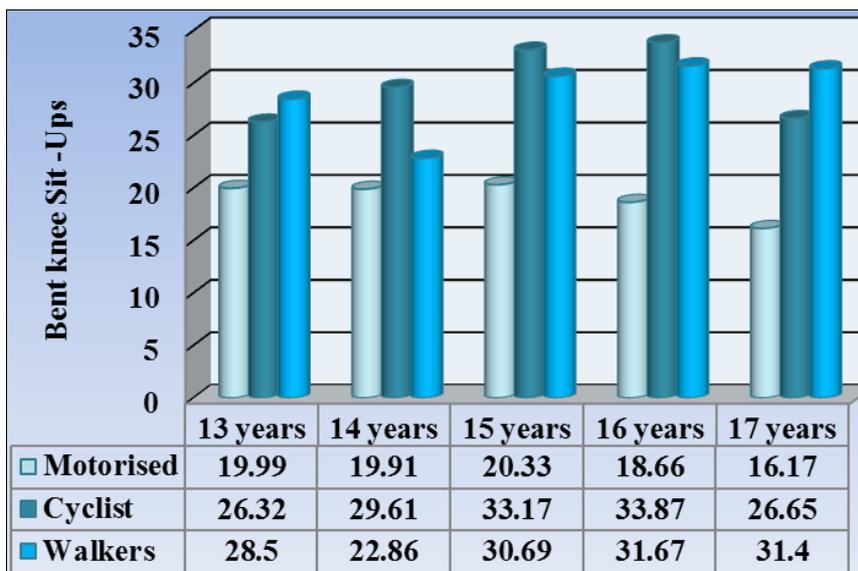


Fig 1: Mean Scores of Muscular Endurance of Chandigarh School Boys

Descriptive analysis of muscular endurance (bent knee sit - ups) among different mode of travelling groups of Chandigarh

school girls (13 to 17 years) have been presented in table-4.

Table 4: Descriptive Analysis of Muscular Endurance (Bent Knee Sit -Ups) Among Different Mode of Travelling Groups of Chandigarh School Girls

GROUP	AGE GROUPS									
	13 Years (100)		14 Years (100)		15 Years (100)		16 Years (100)		17 Years (100)	
	Mean	SD								
Motorised	19.06	4.66	20.30	5.72	5.72	5.08	16.84	4.89	17.85	5.85
Cyclist	30.86	8.24	27.90	7.04	7.04	4.73	25.36	6.52	31.99	7.39
Walkers	29.20	7.78	22.86	7.93	7.93	7.11	21.85	5.89	28.48	6.93

The Cyclist age group of muscular endurance of 13, 14, 16 and 17 years of school girls of Chandigarh was the highest with the mean value of 30.86, 27.90, 25.36 and 31.99 followed by 15 years of school girls with mean value of 7.04 respectively and the Cyclist group was found uppermost mean

value to Walkers and Motorised group of Chandigarh school girls. The Walkers age group of muscular endurance of 13, 14,15,16 and 17 years of school girls of Chandigarh was the greater with the mean value 29.20, 22.86, 7.93,21.85 followed by the Motorised age group of Chandigarh school girls.

The Motorised age group of muscular endurance of value 19.06, 20.30, 5.72, 16.84 and 17.85 respectively. 13,14,15,16 and 17years was found minimum with mean

**Table 5:** Analysis of Variance of Different Mode of Travelling Groups of Chandigarh School Girls on Muscular Endurance (Bent Knee Sit-Ups)

Age Group	Source of variance	Sum of Squares	Df	Mean Square	F-Value	Sig
13 Years	Between Groups	8160.50	2	4080.25	81.45*	.00
	Within Groups	14877.68	297	50.09		
	Total	23038.18	299			
14 Years	Between Groups	2990.50	2	1495.25	30.87*	.00
	Within Groups	14384.04	297	48.43		
	Total	17374.54	299			
15 Years	Between Groups	13429.52	2	6714.76	203.62*	.00
	Within Groups	9794.06	297	32.97		
	Total	23223.58	299			
16 Years	Between Groups	3667.02	2	1833.51	54.28*	.00
	Within Groups	10031.23	297	33.77		
	Total	13698.25	299			
17 Years	Between Groups	10841.88	2	5420.94	118.63*	.00
	Within Groups	13570.70	297	45.69		
	Total	24412.58	299			

\*Significant at.05 level  $F_{0.05}(2, 297) = 3.03$

The above results indicate that there has been a significant difference found among various mode of travelling groups of school girls of Chandigarh on muscular endurance variable as the obtained F values (81.45, 30.87, 203.62, 54.28 and 118.63) was found to be greater than the table value of 3.03 which was required to be significant at.05 level. Further,

Scheffe’s post-hoc test of significant was applied to find out the actual significant difference on muscular endurance among different mode of travelling groups existed. The results of post hoc test of significance have been presented in table-6.

**Table 6:** Significant Difference between the Paired Means of Muscular Endurance of School Girls among Different Mode of Travelling Groups

AGE GROUP	GROUPS			MD	Sig.
	Motorised	Cyclist	Walker		
13 Years	19.06	30.86	-----	11.80*	.00
	19.06	-----	29.20	10.14*	.00
	19.06	30.86	-----	11.80*	.00
	-----	30.86	29.20	1.66	.25
	19.06	-----	29.20	10.14*	.00
	-----	30.86	29.20	1.66	.25
14 Years	20.30	27.90	-----	7.60*	.00
	20.30	-----	22.86	2.56*	.03
	20.30	27.90	-----	7.60*	.00
	-----	27.90	22.86	5.04*	.00
	20.30	-----	22.86	2.56*	.03
	-----	27.90	22.86	5.04*	.00
15 Years	20.49	35.17	-----	14.68*	.00
	20.49	-----	21.52	1.03	.44
	20.49	35.17	-----	14.68*	.00
	-----	35.17	21.52	13.65*	.00
	20.49	-----	21.52	1.03	.44
	-----	35.17	21.52	13.65*	.00
16 Years	16.84	25.36	-----	8.52*	.00
	16.84	-----	21.85	5.01*	.00
	16.84	25.36	-----	8.52*	.00
	-----	25.36	21.85	3.51*	.0
	16.84	-----	21.85	5.01*	.00
	-----	25.36	21.85	3.51*	.00
17 Years	17.85	31.99	-----	14.14*	.00
	17.85	-----	28.48	10.63*	.00
	17.85	31.99	-----	14.14*	.00
	-----	31.99	28.48	3.51*	.00
	17.85	-----	28.48	10.63*	.00
	-----	31.99	28.48	3.51*	.00

\*The mean difference is significant at the 0.05 level.

The result of Scheffe’s post-hoc test related to Muscular endurance variable at all the three different mode of travelling groups indicated that the Cyclists group of Chandigarh school

girls were significantly stronger than the Walkers and Walkers further found superior to Motorised group because of masculine factor which was developed due to the use of

manual transport system to and fro school. The mean difference of Muscular endurance is 11.80, 10.14, (13 years), 7.60, 2.56, 5.04 (14 years), 14.68, 13.65, (15years), 8.52, 5.01, 3.51 (16 years), 14.14, 10.63, 3.51(17years) between scores pertaining to muscular endurance were found higher than the critical ratio of.00, and.03. Mean scores of different mode travelling groups of Chandigarh school girls on muscular endurance are depicted graphically in figure-2.



**Fig 2:** Mean Scores of Muscular Endurance of Chandigarh School Girls

### Discussion of Finding

The findings of the study confirmed that there were significant difference obtained on muscular endurance among different mode of travelling groups of school girls and boys of Chandigarh. From the above analysis the cyclist boys and girls of Chandigarh schools were maximum muscular endurance and walker's muscular endurance is superior to motorized group. The findings were substantiated with Ostergaard *et al.* (2013) [7] stated that cycling and walking to school, higher isometric muscle endurance compare to passive commuters. However the results in accordance with the findings of Aries (2011) who shows that CS increasing overall physical activity levels through interventions in different domains such as active commuting to school. The result of the present study endorse with the view of Kashyap (2013) [6], who shows manual transportation system to and fro school promote better physical fitness and commuter cycling and walking may be a way to improve social aspect of life. However Anderson *et al.* (2008, 2009) shows that muscular endurance was higher in cyclist compared with walkers and passive travelers. Also study shows, that commuter bicycling may be a way to improve health in adolescents.

### Conclusion

On the basis of these findings comparative results on effectiveness of active transportation on muscular endurance of school boys and girls of Chandigarh shows that cyclist group of boys achieved top notch level of muscular endurance than walkers, but walkers were superior to motorized group of school boys. Cyclists group of school girls were significantly superior to their counterparts.

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