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Differential influence of gender on the effectiveness of structured physical education on health-related physical fitness of elementary school students

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Abstract

The study aims to find out the differential influence of gender on the effectiveness of a Structured Physical Education Programme (SPEP) on health-related physical fitness (Cardiorespiratory endurance, Muscular strength, Muscular endurance, Flexibility, and Body composition) of elementary school students of Kerala. The pre-test post-test control group design was employed to test a single null hypothesis by collecting data from 171 elementary school children (age range 10-12 years) from six intact classes, two each from fifth, sixth and seventh grade levels. The participants were separated into control groups and experimental groups, comprised of children from different grade levels. The groups were pretested for the five health-related physical fitness components by employing standard methods. The gain scores obtained by subtracting the pre-test scores from the post-test scores for the gender-based sub-samples were compared by employing the independent sample t-test and two-tailed test of significance for two independent proportions to test the null hypothesis. The analyses exposed that gender exert a significant differential influence on the effectiveness of the SPEP in improving cardiorespiratory endurance, muscular endurance, muscular flexibility and body composition of elementary school students. However, gender is not a significant factor that differentiate elementary school students on the basis of the success of the SPEP in enhancing the muscular strength of the students.

Keywords: Structured physical education programme, health-related physical fitness, muscular strength, cardiorespiratory endurance, muscular endurance, flexibility, body composition

Introduction

Physical fitness is an important component to leading a healthy lifestyle. The inclusion of regular fitness activity helps students maintain fitness, develop muscular strength and improve cardiovascular health. It is associated with lower prevalence of cardiovascular disease risk factors, reduces total and abdominal adiposity, improves mental and bone health, increases academic performance in young people, and protects against all-cause mortality (Kvaavik, Klepp, Tell, Meyer & Batty, 2009)^[5]. Ortega, Ruiz, Castillo, Sjostrom, 2008)^[8]. Among school-age children, there is evidence that physical fitness is more strongly related to metabolic risk than physical activity (Rizzo, Ruiz, Hurtig-Wennlof, Ortega & Sjostrom, 2007)^[9]. A regular fitness activity improves the absorption of nutrients by the body, improves digestive processes and increases physiological processes. In spite of the beneficial effects of physical education on the all-round development of the personality and academic excellence of children, many schools have cut back on their physical education programmes, placing greater emphasis on academics as they strive to prepare students for college and the workforce. Worldwide, childhood obesity has increased 10 times in the last 40 years, and it is considered a serious public health issue (World Health Organization, 2019)^[11]. A sedentary lifestyle is widely recognized as a contributor to the development of obesity and is also associated with decreased physical fitness, academic performance, self-esteem, and increased aggression in children (Active Healthy Kids Canada, 2011)^[11].

Though school curriculum offers structured physical education as a compulsory subject for children at all grade levels in the state of Kerala (India), it is the most neglected subject as there is no term-end or year-end examination for it. Lack of awareness and desirable attitude towards physical activities, lack of understanding on the relationship of physical activity with health-related physical fitness, the false notion that wasting time and energy for physical activity will compromise with learning of other academic subjects etc. are the major reasons

for not taking physical education as a serious business of school life. Researches in recent years have come out with ample evidences to highlight that spending time for physical activities is no more a waste of time, instead it contributes to academic achievement of boys and girls by fostering their mental and physical wellbeing (Barth, Skulberg, Anderssen, Tjomsland & Thurston, 2021 [2]. Getu, 2020 [3]. Marques, Gomez, Martins, Catunda & Sarmiento, 2017) [6]. Gender difference in the physical fitness and physical activity among individuals in different ages have been reported in the literature of sports research (McCarthy & Warne, 2022 [7]. Silva, Barbosa & Del Duca, 2014 [11]. Khan & Masood, 2010) [4]. Research evidences are needed to address the ever increasing sedentary behaviour among children and its health effect. In this context, this investigation aims to explore the differential influence of gender on the effectiveness of structured physical education programme in enhancing physical fitness of elementary school students of Kerala.

Objective

The objective of the present study is to find out the differential influence of gender on the effect of structured physical education on health-related physical fitness of elementary school students of Kerala.

Hypothesis

The study tested a single null hypothesis: "Gender has no significant differential influence on the effect of structured physical education on health-related physical fitness of elementary school students".

Methodology

1. **Method:** Quasi-experimental research which followed pretest-posttest control group design was employed for the study.
2. **Population and Sample:** Children in the age range 10-12 years, studying in grades fifth, sixth and seventh, in elementary schools affiliated to Kerala Board of Public Examination, Govt. of Kerala (India) constituted the population for the study. A total number of 171 elementary school students belonging to six upper primary classes, two divisions each from Standard V, VI and VII (grade levels 5th, 6th & 7th), of the St. Thomas Higher Secondary School, Malayattoor, located in the Angamaly Block of Ernakulam district (Kerala State), constitute the participants of the study.
3. **The Experimental Intervention:** The classes were randomly assigned to the control group and the experimental group in such way that one division each from each grade level was allotted to the groups. The control groups and the experimental groups were pre-tested for five physical-health components, *viz.*, cardiorespiratory endurance, muscular strength, muscular endurance, flexibility, and body composition. This is followed by intervention with the Structured Physical Education Programme (SPEP) for the experimental groups, while the control groups were left free. Both the groups, however, were not prevented from getting the routine physical education classes as per the school timetable by the school physical education instructor. The experimental intervention consisted of 36 structured physical education classes each of 40 minutes

duration, given at the rate of three classes per week (from 3.30 pm to 4.15 pm) by qualified and experienced teachers of physical education.

4. **Tools & Techniques:** Standard methods and tools were used for measuring health-related physical fitness of the participants. Accordingly, the cardiorespiratory endurance was assessed by the 1-Mile endurance Run/Walk Test, Muscular strength by the Modified pull-ups, Muscular endurance by the Sit-up test, Flexibility by Sit and reach test, and the Body composition by estimating Body Mass Index (BMI).
5. **Statistical Techniques Employed:** Apart from the estimation of descriptive statistical indices such as Mean, Median, Standard deviation, Skewness, Kurtosis and Standard error of mean, the data were subjected to independent sample t-test and two-tailed test of significance for two independent proportions for testing the hypothesis.

Analysis and Interpretation

The differential influence of gender on the effectiveness of structured physical education on health-related physical fitness (HRPF) of elementary school students was studied by comparing boys and girls in the experimental group with respect to the gain scores (*estimated by subtracting pre-test score from post-test score*) of different components of physical fitness.

Differential influence of gender on the effect of SPEP on cardiorespiratory endurance

The boys and girls in the experimental group were compared with regard to the gain scores of cardiorespiratory endurance test (the time taken to complete 1600m Walking/Running) to find out significant difference, if any. The data and result of the independent sample t-test performed is given in Table 1.

Table 1: Comparison of the gain cardiorespiratory endurance test scores of boys and girls in the experimental group

Groups	Statistical Indices				t	Sig
	N	M	SD	SE _M		
Boys	44	-.475	.304	.046	3.814	.001
Girls	47	-.728	.327	.048		

The t-value estimated is significant at 99.9% confidence interval, revealing a true difference between boys and girls in the elementary schools regarding the effect of Structured Physical Education Programme on their cardiorespiratory endurance ($t = 3.814$; $p < .001$). Inspection of the mean estimates shows that structured physical education is more effective in girls than in boys. The negative sign in the mean estimates indicates a decrease in the time taken to complete the 1600 m Walking Running Test.

Differential influence of gender on the effect of SPEP on muscular endurance

The gender groups of participants in the experimental group were compared with respect to the gain scores of muscular endurance (number of sit-ups in a minute) so as to find out the differential effect of gender on the effect of SPEP on muscular endurance. The data and result of the independent sample t-test performed in this context is given in Table 2.

Table 2: Comparison of the gain muscular endurance scores of boys and girls in the experimental group.

Groups	Statistical Indices				t	Sig
	N	M	SD	SE _M		
Boys	44	1.66	1.01	.152	4.808	.001
Girls	47	2.94	1.47	.214		

The t-value obtained on comparing the gender groups is large enough to be significant at 99.9% confidence interval ($t = 4.808$; $p < .001$). It means that there is true difference between boys and girls with respect to the effect of structured physical education programme on the muscular endurance of elementary school students. Inspection of the mean estimates make it clear that the SPEP was more successful in enhancing the muscular endurance of girls, compared to that of boys.

Differential influence of gender on the effect of SPEP on flexibility

In order to find out whether there is any significant gender difference in the efficacy of SPEP on the muscular flexibility of elementary school students, the gain scores of sit and reach test of boys and girls were compared. The data and result of the t-test carried out incidentally is given in Table 3.

Table 3: Comparison of the gain flexibility scores of boys and girls in the experimental group

Groups	Statistical Indices				t	Sig
	N	M	SD	SE _M		
Boys	44	3.02	1.87	.282	2.841	.01
Girls	47	1.94	1.77	.259		

The result of the two-tailed test of significance shows that there is a true difference between boys and girls with respect to the improvement they made in muscular flexibility ($t = 2.841$; $p < .01$). A closer observation of the mean scores exposes that the SPEP was more successful with boys than with girls in improving their flexibility.

Differential influence of gender on the effect of SPEP on muscular strength

The boys and girls in the experimental group were compared to find out the significant difference, if any, with regard to the effect of structured physical education on the muscular strength of elementary school students. The data and result of the independent sample t-test done to compare the gain scores of the modified pull-up test is given in Table 4.

Table 4: Comparison of the gain pull up test scores of boys and girls in the experimental group

	Statistical Indices				t	Sig
	N	M	SD	SE _M		
Boys	44	1.68	1.290	.194	0.226	NS
Girls	47	1.74	1.359	.198		

The t-value estimated on comparing the gender groups with respect to the gain scores of muscular strength scores of students in the experimental group is not large enough to be significant at least at 95% confidence interval ($t = 0.226$; $p > .05$). It exposes that boys and girls are almost alike regarding the effect of SPEP in improving their muscular strength. In other words, structured physical education are equally effective for both boys and girls in enhancing their muscular strength.

Differential influence of gender on the effect of SPEP on body composition

The differential influence of gender on the efficacy of structured physical education on body composition of elementary school students was studied by comparing the proportion of boys and girls in the overweight and underweight categories who attained normal weight as a result of the treatment. The data and result of the two-tailed test of significance for the differences between two independent proportions performed in this context is given in Table 5.

Table 5: Comparison of boys and girls in the experimental group with regard to the proportion of overweight and underweight children who attained normal weight

Groups	N	I	P	Z	Sig.
Boys	13	10	0.769	1.985	.05
Girls	13	5	0.385		

The z-value estimated is significant at 95% confidence interval ($z = 1.985$; $p < .05$), revealing that boys and girls differ significantly regarding the effect of structured physical education on the body composition. A closer observation of the proportions estimated for the gender groups shows that the structured physical education programme is more effective in maintaining the body composition of boys than that of girls.

Conclusions

Gender has significant differential influence on the success of structured physical education in promoting cardiorespiratory endurance of elementary school students. The structured physical education is more effective in promoting the cardiorespiratory endurance of girls than that of boys. Gender is a critical factor in the effectiveness of structured physical education in enhancing the muscular endurance of elementary school students. The structured physical education programme was found more successful in enhancing the muscular endurance of girls compared to that of boys. Boys and girls differ significantly with regard to the improvement they made in flexibility when exposed to structured physical education programme. The SPEP is found to be more effective in bringing about body flexibility in boys than in girls. Gender of the learner is not a significant decisive factor in discriminating elementary school students on the basis of the effect of structured physical education on their muscular strength. The SPEP is more effective for boys than for girls to attain normal body weight. The analyses carried out show that significant gender difference exists among elementary school students with respect to the effect of structured physical education on improving cardiorespiratory endurance ($t = 3.814$; $p < .001$), muscular endurance ($t = 4.808$; $p < .001$), muscular flexibility ($t = 2.841$; $p < .01$), and body composition ($z = 1.985$; $p < .05$). No significant gender difference, however, was found to exist in the case of the efficacy of SPEP in enhancing the muscular strength ($t = 0.226$; $p > .05$) of the students. The hypothesis formulated in this context (gender has no significant differential influence on the effect of structured physical education on health-related physical fitness of elementary school students) is, therefore, partially accepted.

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