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Effect of structured physical education on academic stress of undergraduate students

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Abstract

The study examined the effect of a Structured Physical Education Programme (SPEP) on academic stress of undergraduate students of Kerala. The investigation further explored the differential influence of gender and age on the effectiveness of SPEP in reducing academic stress of the participants. The quasi-experimental study adopted the pretest-posttest control group design where undergraduate students (n = 92) of all the three years of study from two colleges were the participants. Students from one college were randomly designated as waitlist control group while students from the other college were taken as treatment group. The treatment group was exposed to 36 sessions of 40 minutes long SPEP intervention. Pre-intervention and post-intervention measure of academic stress was done, and the data were analysed to test the hypotheses. The results showed that SPEP is effective in reducing academic stress of undergraduate students. Gender exerts a significant differential influence on the efficacy of SPEP in alleviating academic stress, the intervention being more effective for female students. Age of the students is a significant factor that discriminates undergraduate students based on the effectiveness in SPEP in relieving academic stress.

Keywords: Structured physical education programme, academic stress, undergraduate students, differential influence

Introduction

Physical education benefits students by increasing their level of physical activity, improving their grades and standardized test scores, and helping them stay on-task in the classroom. Increased time spent on physical education does not negatively affect students' academic achievement (Castelli, Glowacki, Barcelona, Calvert & Hwang, 2014) [3]. There is strong evidence that physical activity is associated with multiple beneficial health outcomes for students, including maintenance of healthy weight, cardiorespiratory fitness, muscular fitness and bone health (Physical Activity Guidelines Advisory Committee, 2018) [13]. Physical activity (PA) takes a particularly key position in health promotion and prevention. It reduces risks for several diseases, overweight, and all-cause mortality (Knight, 2012) [8] and is beneficial for physical, psychological and social health (Gothe, Ehlers, Salerno, Fanning, Kramer & McAuley, 2020) [4], as well as for academic achievement (Kari, Pehkonen, Hutri-Kähönen, Raitakari & Tammelin, 2017) [6]. However, PA levels decrease from childhood through adolescence and into adulthood (Kwan, Cairney, Faulkner & Pullenayegum, 2012) [9]. Late adolescence and emerging adulthood are transitional periods marked by major physiological and psychological changes, including elevated stress (Matud, Díaz, Bethencourt & Ibanez I, 2020) [12]. This pattern is particularly true for college students. According to the 2015 American College Health Association-National College Health Assessment survey, three in four college students self-reported feeling stressed, while one in five college students reported stress-related suicidal ideation (American Psychological Association, 2020) [7]. As many as 87% of college students surveyed across the United States cited education as their primary source of stress.

College students are exposed to novel academic stressors, such as an extensive academic course load, substantial studying, time management, classroom competition, financial concerns, familial pressures, and adapting to a new environment (Karyotaki, Cuijpers, Albor, Alonso, Auerbach, & Bantjes, 2020) [7]. Indeed, many mental health disorders, including depression, anxiety, and substance abuse disorder, begin during this period (Liu, Ping, & Gao, 2019) [10]. Recent studies have reported a high incidence of academic stress among college students in Kerala (e.g., Baiju & Rajalakshmi, 2021) [12].

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Increasing psychological distress among college students of Kerala has also been reported in recent times (e.g., Sathidevi, 2017) [14]. Studies have reported that the participation of college students of Kerala in physical activities is not at an appreciable level (Seeja, 2022; Joy & Vincent, 2020; Manoj & Ajith, 2017) [15, 5, 11]. Amruth and Kumar (2019) reported that 18.2% of college students of Kerala are overweighted, and 2.1% are obese. In the context of mounting academic stress among college students, increasing incidence of stress related psychological problems, declining attitude towards physical activities, sedentary mode of life due to over dependency on digital media etc. compelled to examine whether increased participation in physical activities have any effect on the ability of college students to cope with academic stress. Since the research literature is silent about the effect of structured physical education on the health-related physical and the academic stress of college students, this study is expected to come out with adequate scientific evidence to associate physical activities with academic stress of college students.

Objectives

The study has the following objectives in view:

- To find out the effect of structured physical education on academic stress of undergraduate students of Kerala.
- To find out the differential influence of gender on the effect of structured physical education on academic stress of undergraduate students of Kerala.
- To find out the differential influence of age on the effect of structured physical education on academic stress of undergraduate students of Kerala.

Hypotheses

The following null hypotheses were tested for the study:

- **H₀₁**: Structured physical education has no significant effect on academic stress of undergraduate students.
- **H₀₂**: Gender has no significant differential influence on the effect of structured physical education on academic stress of undergraduate students.
- **H₀₃**: Age has no significant differential influence on the effect of structured physical education on academic stress of undergraduate students.

Methodology

1. **Method**: Quasi-experimental research with pretest-posttest control group design was adopted for the study.

2. **Population**: The population of the present study is students doing their first-degree programme (undergraduate programme) in the Arts and Science Colleges affiliated to any of the universities in the Indian state of Kerala. Normally they are individuals in their late adolescence in the age range 18-20.
3. **Participants**: A voluntary group of 92 undergraduate students (Male = 49; Female = 43) from two conveniently selected Arts and Science Colleges affiliated to University of Calicut (Kerala, India) constituted the sample for the study. Students from one college were randomly designated as control group (N=33; male = 17; female = 16) while students from the other college were taken as treatment group (N=59; male = 32; female = 27).
4. **Tools**: The academic stress of the participants was measured by using the Academic Stress Scale for College Students (ASCS) developed. The ASCS is a standardised instrument which generate a quantitative measure of the measure of the physiological and psychological stress that the learners experience due to their lack of adequate ability to cope with the demands of academic challenges. It is a 50 item Likert type Rating Scale which covers six dimensions of academic stress, viz., (i) Cognitive, (ii) Affective, (iii) Behavioural, (iv) Physical, (v) Interpersonal, and (vi) Motivational. The ASCS has a concurrent validity of 0.76 and test re-test reliability of 0.84.
5. **Experimental Intervention**: The groups were pre-tested for their academic stress followed by 12 weeks long intervention (36 interventions at the rate of 3 interventions per week, each of 40 minutes duration) with Structured Physical Education Programme for Undergraduates (SPEPU) developed by the investigators. The ASCS was administered one week after the end of experimental intervention to collect the post-test scores.
6. **Statistical Techniques Employed**: One-way ANCOVA and Independent sample t-test were used to test the hypotheses apart from descriptive statistical techniques.

Analysis and Interpretation

The descriptive as well as the inferential statistical analyses performed to test the hypotheses are given in this section under appropriate subheadings:

Table 1: Statistical indices pertaining to pre-test-, post-test- and gain scores of academic stress of control group and treatment group

Testing	Groups	N	Range	M	MDN	Σ	SK	KU	SE _M
Pre-test	CG	33	61	180.5	178.0	15.20	-0.16	-0.11	2.65
	TG	59	66	181.7	180.0	16.85	0.12	-0.83	2.19
Post-test	CG	33	62	180.0	179.0	15.22	-0.13	-0.03	2.65
	TG	59	77	175.8	173.0	16.64	0.25	-0.49	2.17
Gain Score	CG	33	5	0.15	0.00	1.75	0.05	-1.54	0.31
	TG	59	20	5.59	6.0	3.43	-0.49	3.07	0.45

Descriptive statistical analysis academic stress scores

The major descriptive statistical indices such as Mean (M), Median (Mdn), Standard Deviation (σ), Skewness (Sk), Kurtosis (Ku), and Standard error of Mean (SEM), estimated from the pre-test, post-test, and the gain scores (difference between pre-test and post-test scores) of academic stress of students in the Control Group (CG) and Treatment Group

(TG) are given in Table 1.

The data presented in Table 1 show that the distributions of pre-test scores, post-test scores and gain scores of academic stress in both the control group and experimental group are normal because the obtained values of skewness for the groupings range from $-\frac{1}{2}$ to $+\frac{1}{2}$.

Effectiveness of structured physical education in reducing academic stress: To find out whether SPEP is effective in reducing academic stress of undergraduate students, the control group and treatment group were compared with

respect to their post-test scores of academic stress after partialling out the effect of pre-test scores by employing analysis of covariance. Then result of the ANCOVA performed in this regard is given in Table 2.

Table 2: Covariate analysis of post-test scores of academic stress

Source	Type III Sum of Squares	DF	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	23185.885 ^a	2	11592.942	1346.911	.000	.968
Intercept	1.814	1	1.814	.211	.647	.002
Pre-test	22695.111	1	22695.111	2636.803	.000	.967
Group	622.922	1	622.922	72.373	.000	.448
Error	766.028	89	8.607			
Total	2926078.000	92				
Corrected Total	23951.913	91				

^a. R Squared = .968 (Adjusted R Squared = .967)

The F-ratio estimated by comparing the post-test scores of academic stress for the treatment group (SPEP) and control group (standalone), after partialled out the effect of pre-intervention scores of academic stress as covariate, is significant ($F=72.373$; $p<0.001$). It shows that structured physical education causes a significant reduction in the academic stress of undergraduate students when exposed to structured physical education. The partial eta squared (η_p^2) estimated is 0.448 which represent the proportion of variance in the dependent variable (academic stress) that is explained by the independent variable (SPEP), relative to the total variance. The value of η_p^2 indicates a large effect size, i.e., 44.8% of the variance in the academic stress is explained by the structured physical education intervention, when controlled for the pre-test scores of academic stress of the groups. Since the Partial Eta Squared is much larger than

0.14, the effect size is very large, revealing that the intervention is highly effective in reducing academic stress.

Differential influence of gender on the effectiveness of SPEP: The differential effect of gender on the efficacy of structured physical education in reducing academic stress of undergraduate students was studied by comparing the gain scores of academic stress obtained by male and female students in the treatment group. The gain score was calculated by subtracting the post-test scores from the pre-test scores of academic stress. Since the SPEP intervention causes a decrease in academic stress, the post-test scores will be usually lower than the pre-test scores. The negative sign indicates a drop in academic stress. Therefore, the absolute values of the difference were taken for comparing the gender groups. The result of the independent sample t-test performed incidentally is given in Table 3.

Table 4.2: Comparison of the academic stress of male and female students

Groups	Statistical Indices				T-Value	Sig.
	N	M	SD	SEM		
Male	32	3.91	2.99	.53	4.845	.001
Female	27	7.59	2.81	.54		

Comparison of the academic stress of male and female students produced a t-value that is significant at 0.01 level ($t = 4.845$; $p<0.001$). It reveals that there is a true difference between male and female students in the loss of academic stress resulting from exposure to SPEP. Scrutiny of the mean estimates shows that the drop in academic stress in female students ($M = 7.59$) is considerably greater than the drop in academic stress in male students ($M = 3.91$). In another words, the structured physical education was more successful with female students in reducing their academic stress than with male students.

Differential influence of age on the effectiveness of SPEP

Since the participants of the study were the first, second and final year students of undergraduate programme, they vary in their age from 18 to 20 years. To find out the differential effect of age on the effectiveness of SPEP on academic stress, students in different ages (18 years, 19 years and 20 years) in the treatment group were compared with respect to the gain scores of their academic stress. Table 4 presents the summary of ANOVA performed incidentally.

Table 4: Comparison of the academic stress of students in different age groups (Summary of ANOVA)

AST	Sum of Squares	DF	Mean Square	F	Sig.
Between Groups	277.838	2	138.919	19.237	.000
Within Groups	277.838	2	138.919		
Total	404.399	56	7.221		

The F-ratio obtained on comparing the gain scores of academic stress of students in different age groups is significant at 99.9% confidence interval ($F = 19.237$; $p<0.001$). It shows the presence of a true difference among undergraduate students in different age groups regarding the

drop in academic stress when exposed to SPEP. The by post-hoc test to find out the group pairs which show true difference in decrease in academic stress. Table 5 presents the result of Scheffe's post-hoc test.

Table 5: Post hoc tests for comparison of the gain scores of academic stress of students in different age groups.

(I) AGE	(J) Age	(I-J) Mean Difference	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
18 Years	19	4.304*	.833	.000	2.21	6.40
	20	4.598*	.860	.000	2.44	6.76
19 Years	18	-4.304*	.833	.000	-6.40	-2.21
	20	.294	.897	.948	-1.96	2.55
20 Years	18	-4.598*	.860	.000	-6.76	-2.44
	20	-.294	.897	.948	-2.55	1.96

The mean difference estimated for different paired groups reveals the following

- There is significant difference between 18-year-old students and 19-year-old students regarding the reduction in academic stress when exposed to SPEP (Mean difference = 4.304; $p < .001$), the difference being in favour of 18-year olds;
- The 20-year-old students significantly trail behind the 18-year-old students in the decrease in academic stress they attained when intervened with SPEP (Mean difference = 4.598; $p < .001$); and
- There is no significant difference between 19-year-old students and 20-year-old students regarding the reduction of academic stress due to treatment with SPEP (Mean difference = 0.294; $p > .05$).

Conclusion

The distributions of the pre-test, the post-test and the gain scores of academic stress of undergraduate students are normal as the value of skewness lies between $-\frac{1}{2}$ and $+\frac{1}{2}$, and thus the data are amenable to parametric analyses. Comparison of control group and treatment group regarding the post-test scores of academic stress, after partialled out the effect of the covariate, demonstrated that the SPEP is effective in reducing the academic stress of undergraduate students. The H_01 (structured physical education has no significant effect on academic stress of undergraduate students) is, thus, rejected. Comparison of the male and female students in the treatment group, regarding the gain scores of academic stress, showed a significant gender difference favouring the female students. It shows that SPEP is more effective for female undergraduate students for reducing their academic stress. The null hypothesis formulated in this context, viz., H_02 (gender has no significant differential influence on the effect of structured physical education on academic stress of undergraduate students) is, therefore, rejected. Comparison of students in different age groups, exposed to SPEP, demonstrated a significant difference favouring the 18-year-old students, who differ significantly from their seniors with 19 years and 20 years in the decrease of academic stress attained when treated with SPEP. The H_03 (age has no significant differential influence on the effect of structured physical education on academic stress of undergraduate students) is, subsequently, rejected.

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