

Effect of Aerobic Exercise on Stress Management among Female College Students

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Abstract: The main purpose of the study was to investigate the effect of aerobic exercise on stress in college students, particularly female students aged 16-19 years. Current research was conducted in the Government Associate College (Women) of Jhang Region. Purposive sampling was applied for the selection of the study sample. The study population consisted of 34 female students aged 16 to 19 years who voluntarily participated in the study. The current study was supported by experimental research. 8 8-week exercise protocol (aerobic) was used to check the effect of aerobic exercise on the stress and well-being of students. The students' stress level was analysed through the standardised perceived stress scale by Lee et al (2014). The obtained data were analyzed by using descriptive statistics (Frequency, percentages, mean, standard deviation) and inferential statistics (paired sample t-test, correlation). The study results found that the aerobic exercise intervention significantly reduced the perceived stress levels of the female college students in the experimental group. These findings of the study showed that college management should encourage female college students to perform regular aerobic exercises in an effort to reduce the perceived levels of stress and should develop outreach programs in an effort to educate female students about the benefits of exercise in reducing stress levels and improving mental health. This will lead to fostering a positive development of the young and produce a healthy and productive nation for society.

Keywords: Aerobic Exercise, Stress, College Students



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Introduction

It is also known that female students are extremely stressed due to the academic demands, social demands, economic challenges, and other life pressures (Pedersen, 2016). These stressors may negatively affect their health status, physical and mental, academic performance, and well-being (Baker et al., 2022).

It is proven that physical activity can be one of the effective ways of decreasing the level of stress and improving mental health among college students (Duffy et al., 2020). They have found out that exercise causes the release of endorphins, which are natural painkillers and mood enhancers (Mebin et al., 2020). Exercise also has the potential to reduce the level of stress hormones in the body, such as cortisol and adrenaline, which could lead to a decrease in the rates of stress and depression (Sharma, 2018).

Regular exercise has also been discovered to have the potential to lead to self-esteem and body image attainment, which are crucial components of general well-being (Thogersen et al., 2011). Exercise can also provide an individual with a sense of accomplishment and improvement in physical appearance, leading to the emergence of self-esteem and confidence (Herbert et al., 2020). It is also disclosed that exercise can be employed to reduce stress levels within college students and enable them to have a healthier well-being (Herbert et al., 2022). During one of the

studies, the engagement in regular exercise proved to be connected with lower perceived stress levels and beneficial mental health in college students in general. In the second study, college-level students in an exercise program of 12 weeks had superior coping mechanisms to stress and overall well-being compared to those who did not have the exercise program (Üstündağ et al., 2019).

Endorphins, or feel-good hormones, are secreted during aerobic activity. These endorphins guarantee that one feels good because they improve mood, decrease stress and anxiety, and lower the tension levels (Shaphe & Chahal, 2020). In addition, it is also found that Extraordinary aerobic exercise decreases the amount of cortisol and other stress hormones in the body. The elevated levels of cortisol correlate with a high degree of stress and anxiety, and with the assistance of aerobic exercise, levels of cortisol can be reduced. Aerobic exercise also makes one forget the pressures of our daily life and concentrate on whatever the activity under consideration is. One can use it as a distraction to reduce stressors, rumination and relaxation of mind (Alghadir et al., 2015).

The aerobic exercise has also been found to be useful in cognitive abilities such as memory, focus and problem-solving abilities. When the cognitive functions are functioning optimally, they will be better placed to cope with the stress and react to the stressful situation in a more productive way (Srinivas et al., 2021). As Heaney et al. (2014) state that to cope with stress, aerobic physical activities are easy, one is advised to do what he/she like to do and are comfortable with. Target a goal of 75 minutes of hard aerobic or at least 150 minutes of moderate aerobic exercise. Nevertheless, even moderate aerobic exercise turns out to be stress-relieving.

Hintz et al. (2015). Exercise has a significant impact on stress management and can be an effective tool for reducing stress levels. Regular physical activity showed various benefits for intellectual and emotional well-being, including stress reduction. Exercise helps to decrease the stress hormone levels, i.e. cortisol, in the human body. Physical activity enhances the production of endorphins, which are natural mood elevators and stress reducers. This leads to a decrease in overall stress and a more positive emotional state.

Exercise stimulates the release of neurotransmitters like dopamine and serotonin that are correlated with improved mood and happiness. Engaging in physical activity can help alleviate symptoms of anxiety and depression, providing a positive mental state that combats stress. Exercise serves as a distraction from daily stressors and allows individuals to focus their attention on the present moment. Engaging in physical activity, whether it's jogging, fast walking, running, jumping rope or any other form of exercise, provides an opportunity to shift the focus away from stressors and promotes relaxation (Mikkelsen et al., 2017).

It is also concluded that exercise is the outcome of stress resiliency. Physical stressors will also get accustomed to the exercise of the body and thus will be open to emotional and mental stress. It is the outcome of this increased power that can be a good attitude and his / her ability to withstand stressors. It may be applied to enhance sleep, which is highly demanded in the event of stress. The amount of sleep taken by a person is sound in de-stressing and general well-being.

Nevertheless, the research on the types of exercises that are the most effective in terms of the stress-reduction effect and the overall impact on the condition of college students and the impact of the physical activity on the variables has not been completed (Holt et al., 2019). Moreover, time factor, financial factor, and motivation of college students can complicate the exercise process, which means that the strategies should trigger exercise among the population of college students (Maselli et al., 2018).

Material and methods

The research design that has been applied in the current research is the post-test experiment and pre-test experiment that employed the longitudinal data analysis to ascertain how the level of stress can be influenced in the case of college students through an 8-week program based on the aerobic exercise program. The cases were clustered into an experimental group (EG = 17) and a control group (CG = 17) based on the inclusion and exclusion criteria provided.



Table 1

Inclusion criteria and Exclusion criteria

Inclusion criteria	Exclusion criteria
Age between 16 and 19 years	Below 16 and above 19 years
The participants who suffered from stress	healthy or normal persons

The target population was the student population of 1st and 2 nd Year course students in the Government Associate College (Women) in Jhang Region in Pakistan, and specifically the female population. First, the Purposive sampling was conducted in a manner that 34 students who were under-stressed were selected from any of the classes. The experimental and the control samples of 17 and 17, respectively, were selected through the use of standardised scales (Cohen et al.,1983). The Perceived Stress Scale (PSS-14) was invented to measure the level of stress in students.

The experimental group (n=17) will get 8 8-week aerobic exercise program, which will be 4 days a week. Exercise modification used in the study of Simons-Morton et al. (1993) consisted of jogging, running, jumping rope and brisk walking. The different meetings were scheduled consistently throughout the period of intervention as the students continued with the activities of school. At this point in time, there was no organized physical activity program in place in the control group (n=17).

To evaluate the level of baseline stress and the level of well-being of the groups, a pre-test was conducted on the two groups prior to the exercise protocol. After the 8-week intervention, a post-test was conducted for both groups. The experimental group performed a consecutive exercise protocol of 8 weeks, four days per week. The types of exercise in which they were engaged were as follows: 17 participants practised aerobic exercises adopted by Simons-Morton et al. (1993), which included jogging, running, jumping rope, and fast walking; and 17 participants practised.

Table 2

Exercise Protocol for Aerobic Exercise

Exercise Protocol (Total duration of activity is 24 minutes)			
Four days per week	Aerobics exercise	Duration (minutes)	Interval
1 st week to 8 th week	▶ Jogging	5	1 min rest
	▶ Fast Walk	5	after each activity
	▶ Running	5	
	▶ Jumping rope	5	

The study was conducted in accordance with ethical principles, including obtaining informed consent from participants, ensuring participant confidentiality, and protecting participants from harm or discomfort during the study. For data analysis, Statistical Product and Service Solution (SPSS) version 26 was used. Data collected through the questionnaires, Perceived Stress Scale, were analysed by using descriptive and inferential statistical methods to determine the effects of exercise on stress among college students.

Results

Table 3

Descriptive Statistics for Demographic and Study Variables by Groups (N = 34)

Demographics	Frequency	Percent
Experimental Group		
Aerobic Exercise Group	17	50.0
Control Group	17	50.0
Locality		
Rural	21	61.8
Urban	13	38.2
Socioeconomic Status		
Upper Class	12	35.3
Middle Class	11	32.4
Lower Class	11	32.4



Demographics	Frequency	Percent
Eating Habits		
Emotional Eater	1	2.9
Habitual Eater	10	29.4
Critical Eaters	8	23.5
Energy Eaters	15	44.1
Physical Activity		
Perform daily physical activities	9	26.5
Part-time perform daily physical activities	13	38.2
Do not perform daily physical activities	12	35.3

Table 4

Comparison between the Experimental Group (Aerobic Exercise) and the control group in the perceived stress scale before the treatment

Independent Samples Test									
Levene's Test for Equality of Variances					t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-t)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
									Lower Upper
Perceived Stress (Pre)	EVA	.459	.503	.611	32	.545	.15294	.25016	-.35661 .66250
	EVNA			.611	30.9	.545	.15294	.25016	-.35726 .66314

Table 4 provides independent samples t-test results for two groups; Levene's test for equality of variances was conducted to determine whether the variances of the two groups were equal. The result of the test was not significant, indicating that the assumption of equal variances was met. The t-test for equality of means was conducted assuming equal variances and yielded a non-significant result ($p = 0.545$), indicating that there was no significant difference between the two groups on their pre-test scores of perceived stress. The mean difference between the two groups was 0.15294. Overall, the results of the analysis suggest that there was no significant difference between the experimental group and the control group in their pre-test scores of perceived stress.

Table 5

Pre and Post-Test Comparison in Perceived Stress of Aerobic Exercise Group

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Percieved Stress (Pre)	3.6132	17	.66056	.16021
	Percieved Stress (Post)	5.0000	17	.70711	.17150

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-t)
		Mean	Std.	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower Upper				
Pair 1	Percieved Stress (Pre & post)	-1.3867	.9331	.22631	-1.86653 -.90700	-6.128	16	.000	

Note: A Lower score of the mean indicates high perceived stress, and a higher score in the mean indicates low perceived stress

Table 5 shows the pre- and post-test comparison in perceived stress of an aerobic exercise group. The table presents descriptive statistics, correlations, and a paired samples test. The paired samples t-test compares the mean difference between the pre- and post-test perceived stress scores to zero. The mean difference was -1.38676, indicating that the perceived stress level decreased after the aerobic exercise intervention. The standard deviation of the differences was 0.93312, and the standard error of the mean was 0.22631. The 95% confidence interval for the mean difference

was between -1.86653 and -0.90700. The t-value was -6.128, and the degrees of freedom were 16. The p-value was less than 0.001, which indicates that the observed difference between the pre- and post-test perceived stress scores was statistically significant. In conclusion, the results suggest that an aerobic exercise intervention can reduce perceived stress levels.

Table 6

Pre and Post-Test Comparison in Perceived Stress of the Control Group

Paired Samples Statistics		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Perceived Stress (Pre)	3.4603	17	.79215	.19213
	Perceived Stress (Post)	3.4838	17	.88978	.21580

Paired Samples Correlations		N	Correlation	Sig.
Pair 1	Perceived Stress (Pre) & (Post)	17	.879	.000

Paired Samples Test		Paired Differences					t	df	Sig. (2-t)
		Mean	Std.	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Perceived Stress (Pre & Post)	-.02353	.42468	.10300	-.24188	.19482	-.228	16	.822

Note: A Lower score of the mean indicates high perceived stress, and a higher score in the mean indicates low perceived stress

Table 6 shows the pre- and post-test comparison in perceived stress of the control group. The participants of the control group do not receive the intervention or treatment that is being tested. The table provides descriptive statistics, correlations, and the paired samples t-test results. The means for perceived stress before (pre) and after (post) the study were 3.4603 and 3.4838, respectively. These scores suggest that, on average, the control group experienced a slightly higher perceived stress after the study compared to before the study. However, the difference between the means is not statistically significant ($t(16) = -.228$, $p = .822$). The standard deviation (SD) of the pre-test score was .79215, while the SD of the post-test score was .88978, suggesting that there was more variability in the post-test scores compared to the pre-test scores.

The correlation between the pre-test and post-test scores was strong ($r = .879$, $p = .000$), indicating that participants who reported high levels of perceived stress before the study tended to report high levels of perceived stress after the study as well. In summary, the table suggests that the control group did not experience a significant change in perceived stress from before to after the study. The strong correlation between pre-test and post-test scores suggests that perceived stress may be a stable characteristic of individuals over time. The higher SD in post-test scores may suggest that the control group was affected by some external factor that increased their perceived stress levels.

Test of Significance (Effects of Demographic Variables on Perceived Stress of Female College Students)

Aerobic Group

Table 1

Effect of Locality on the Perceived Stress of Female College Students

Testing Variable	Locality	N	Mean	Std.	t	Sig.
Perceived Stress (Post)	Rural	21	4.3452	1.06068	.688	.496
	Urban	13	4.0750	1.19443		

Note: A Lower score of the mean indicates high perceived stress, and a higher score in the mean indicates low perceived stress



Table 7 examines the effect of locality on perceived stress. The mean perceived stress scores were 4.3452 and 4.0750 for rural and urban students, respectively. However, the difference between the means was not statistically significant ($t = .688$, $p = .496$). Therefore, locality does not appear to have a significant effect on the perceived stress of female college students.

Table 8

Effect of Socioeconomic Status on the Perceived Stress of Female College Students

Socioeconomic Status	N	Mean	Std. Deviation	F	Sig.
Upper Class	12	4.1604	1.22986	.049	.953
Middle Class	11	4.2750	1.10595		
Lower Class	11	4.2977	1.05886		
Total	34	4.2419	1.10381		

Note: A Lower score of the mean indicates high perceived stress, and a higher score in the mean indicates low perceived stress

Table 8 examines the effect of socioeconomic status on perceived stress. The mean perceived stress scores were 4.1604, 4.2750, and 4.2977 for upper, middle, and lower-class students, respectively. The ANOVA test showed that there was no statistically significant difference between the means of the different socioeconomic status groups ($F = .049$, $p = .953$).

Table 9

The Effect of Eating Habits on the Perceived Stress of Female College Students

Eating Habits	N	Mean	Std. Deviation	F	Sig.
Emotional Eater	1	6.0000	1.32016	1.100	.365
Habitual eater	10	4.1000	1.40599		
Critical Eaters	8	3.9906	.92620		
Energy Eaters	15	4.3533	.94216		
Total	34	4.2419	1.10381		

Note: A Lower score of the mean indicates high perceived stress, and a higher score in the mean indicates low perceived stress

Table 9 examines the effect of eating habits on perceived stress. The mean perceived stress scores were 6.0000, 4.1000, 3.9906, and 4.3533 for emotional eaters, habitual eaters, critical eaters, and energy eaters, respectively. However, the sample size for emotional eaters was only one, making it difficult to draw conclusions about this group. The ANOVA test showed that there was no statistically significant difference between the means of the different eating habits groups ($F = 1.100$, $p = .365$).

Table 10

Effect of Current Daily Physical Activity Routine on the Perceived Stress of Female College Students

Current daily physical activities routine	N	Mean	Std.	F	Sig.
Perform daily physical activities	9	3.9306	1.74959	1.044	.364
part-time perform daily physical activities	13	4.1308	.69725		
Do not perform daily physical activities	12	4.5958	.81734		
Total	34	4.2419	1.10381		

Note: A Lower score of the mean indicates high perceived stress, and a higher score in the mean indicates low perceived stress

Table 10 examines the effect of the current daily physical activity routine on perceived stress. The mean perceived stress scores were 3.9306, 4.1308, and 4.5958 for students who perform daily physical activities, part-time perform daily physical activities, and do not perform daily physical activities, respectively. However, the difference between the means was not statistically significant ($F = 1.044$, $p = .364$).



Findings and Discussion

The findings provide strong evidence that aerobic exercise reduces stress among female college students. The significant improvement in the experimental group supports the reduction of stress from regular aerobic activity. Research indicates that aerobic exercise stimulates the release of endorphins and other neurotransmitters that improve mood and reduce tension (Craft & Perna, 2004). The structured activities employed in this study, jogging, running, rope jumping, and brisk walking, have previously been identified as effective stress-reducing exercises (Simons-Morton et al., 1993).

The non-significant results in the control group confirm that stress reduction was due to the intervention rather than external factors. These findings are consistent with earlier studies showing that without exercise interventions, mental condition cannot and does not lower perceived stress in student populations (Brown et al., 2013).

Interestingly, demographic variables such as socioeconomic status, locality, and eating habits did not significantly influence stress levels. This aligns with the suggestion that academic stress is a widespread issue among students, not necessarily bound to social or economic background (Bayram & Bilgel, 2008). Moreover, although students with no daily physical activity tended to have higher stress scores, the differences were not statistically significant, reinforcing the unique impact of structured aerobic exercise protocols compared to general daily activity.

Finally, the conclusions show the possibilities of interventions in schools with aerobic exercise programs to replace the increasing levels of stress among college students. These interventions will have a positive effect on the mental health outcomes, but also school performance and wellness, in general (Biddle et al., 2015).

Conclusions

The study that was reviewed was created on the value of exercise in terms of stress management among the female students in the age group of 16-19 years at the colleges. The results established that aerobic exercise was observed to have de-stressing elements on the perceived stress. Further on, the demographic variables that were included in the degree of stress of the respondents were the locality, ethnicity, socioeconomic status, parent schooling, eating and the current exercise practices of the respondents, which had no significant influence on their levels of stress. The overall findings indicate that aerobic exercise is important in relieving stress in female college students. It is an instrument of rising emotional stability and psychological well-being. To live a healthier life, reduce the stress associated with it, and have better academic performance, the colleges must be furnished with a well-coordinated workout program, as discussed in the investigation. Other explanations as to why researchers can utilise such findings in future include a diversified population and exercise programs period.

Recommendations

1. Encourage aerobic activities among college female students to reduce the levels of perceived stress among them.
2. Offer aerobic and exercise programs or physical activity opportunities to the female students so that they can minimise their stress levels.
3. Study the opportunities of mindfulness meditation in order to lessen stress and improve the quality of life among college students.
4. Cultivate a culture among women students to engage in active physical exercises with their friends or in a group in order to promote social associations and improve their mental health.
5. Technology, social media, and breaks may be stressful and result in poor mental health, and that is not what female students are supposed to be.
6. Consider the notion of time management and organisation skill seminars or workshops that would help the female students to reorganise their academic and personal lives.
7. Mental health counselling centres and peer support groups are provided to render the campuses and services adequate.
8. Train staff and faculty to be aware and responsive of signs of distress in students and make the relevant referrals to mental health services.



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