Original Article

Association of Stress Coping Strategies and Leisure Time Physical Activity with Academic Performance in Medical Students

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Abstract

Background: In recent times, the incidence of stress has increased dramatically, and it is now becoming prevalent in students as well. This study aims to identify different coping strategies and leisure-time physical activity in medical students, and their association with academic performance throughout the stressful event of professional examinations using the brief Coping Orientation to Problems Experienced (COPE) inventory.

Materials and Methods: It is a cross-sectional correlational study done during August 2019 to November 2019. Students enrolled in Bachelor of Medicine, Bachelor of Surgery (MBBS) studying at Rawalpindi Medical University, Pakistan participated in this research during their professional examinations. Independent sample t-tests were used to identify differences between the two academic groups (high and low achievers) by coping strategies, like approach coping and avoidant coping. The Spearman's rho test was applied to find correlation between leisure time activity and academic status of students. High achievers were defined as those with average scores greater than 70% (and distinction, if any). Those with scores less than 70% (and supplementary exams taken if any) were classified as low achievers.

Results: The majority of participants were females 259 (56.4%). Out of 459 students, 225(49%) were high achievers, while 234(51%) were low achievers. A weak negative correlation was established between sedentary/insufficiently active lifestyle (r (2) =0.114, P=0.015) and academic status. The mean scores of approach coping (mean =30.80, SD=5.32) were significantly higher for high achievers. By comparison, the mean scores of avoidant coping (mean =48.75, SD=4.92) were considerably higher for low achievers.

Conclusion: A medium level of leisure-time physical activity and approach coping strategies such as active coping, emotional support, and diligent planning have considerable positive effects on performance.

Keywords: Stress coping, leisure activities, psychological adaptation, academic performance, medical students.

Introduction

In recent times, owing to changing trends in our societies, the incidence of stress has increased dramatically, and it is now becoming prevalent in our students as well. Stress is our body's response to the changing surroundings; stimulus in any form affects and demands a response in physical, mental, and emotional capabilities. According to the American Psychological Association (APA), stress is considered dangerous only when it affects normal daily routine functioning.[1,2] Stress is pervasive among medical students because of various psychological factors and elevated academic burden. Studies have shown that 41.9% of medical students in a Malaysian medical school have psychological stress.[3,4] In a study conducted in Pakistan, 59.7% of the medical college students were affected by high levels of stress.[5] Stress makes the person anxious and changes all the body's systems, including musculoskeletal, respiratory, cardiovascular, endocrine, gastrointestinal, nervous, and reproductive. All these effects of stress can be devastating and need to be addressed.[6]

Sources of stress depend on cultural and social norms and vary in different countries. In Pakistan, medical students' most common causes were related to academic and psychosocial interests.[7] However, high levels of stress can affect students' mental health to such an extent that stress and depressive thoughts were found to be linked to suicidal thoughts among medical students.[8]

Coping means investing one's own conscious effort to solve personal and interpersonal problems and master, minimize, or tolerate stress and conflict.[9] Over time, humans have adopted different mechanisms termed as coping strategies to deal with stressors. These are broadly divided into two categories, those in which a person intends to act (problem-focused coping) and those in which a person avoids the stress and activates emotional states (emotional-focused coping). These strategies are directed either towards or away from the stress, so the metaphors approach and avoidance were also used respectively.[10] Active coping strategies include methods such as seeking emotional support, employing acceptance, and diligent planning. Meanwhile, avoidant strategies focus on escaping confrontation, such as denial, self-distraction, and other compulsive behavior. Avoidant coping is considered to be responsible for various adverse stressful life events. Thus, in dealing with stressors, active coping is deemed to be better than avoidant coping. It was the preferred strategy employed by medical students in a study conducted in Malaysia.[11]

Although active coping strategies are essential to cope with stress adequately, other factors are useful as well. One of these is an appropriate amount of physical activity. Moderate physical activity has many beneficial effects on health.[12] Physical activity is any bodily movement produced by skeletal muscles that require energy expenditure and should not be confused with exercise, which is a subcategory. Many studies accentuate the significance of physical activity in decreasing stress among medical students. So, those students who participate eagerly in physical activities show fewer stress symptoms than those with sedentary lifestyles.[13]

Leisure-time physical activity (LTPA), an essential subtype of physical activity, is any activity that an individual does in their idle time, and it increases the total energy expenditure. As compared to other physical activities, it is performed with higher intensity and is unrelated to daily work and household activities.[14] Higher leisure-time physical activity was the reason behind the lower incidence of stress among individuals.[15] Leisure-time activities and exercise were also found to be adopted as stress dealing strategies among students.[16]

In Pakistan, the vastness of the academic curriculum, frequency of examinations, performance in exams, and uncertainties about their future are particularly noteworthy.[7] Given the detrimental effects of stress, such as worsening physical and mental health and suicidal thoughts[8], students must be aware of the beneficial coping strategies to eliminate stressors. Furthermore, the positive effects of leisure-time physical activities upon the declining trends of stress cannot be overlooked.[15] There is much literature on stress, its different sources, and various coping strategies employed by medical students. While studies have shown significant relationships between physical activity and academic achievement [17,18,19], little is known about the link between LTPA, stress coping strategies and their effect on the academic performance of medical students. Pearson's χ^2 analysis revealed differences in grade point average with aerobic activity ($\chi^2 = 44.29$, $P \leq 0.001$), with higher levels of aerobic activity being associated with higher grade point averages.[17] Moreover, while some studies do show a link between LTPA and stress[15,16], there is no current study that explores the relationship between LTPA and its effect on academic achievement.

Similarly, studies by different authors have shown that approach-based coping strategies positively correlate with academic achievement.[19-22] Rational coping strategies (problem-solving, positive reappraisal, seeking social support) were negatively associated with perceived stress (β=-0.25, p<0.01), whereas emotional coping strategies (venting negative emotions, negative auto-focus) were linked to increased academic stress (β=0.34, p<0.01). Moreover, rational and emotional coping strategies were, respectively, positively (β=0.16, p<0.05) and negatively (β=-0.22, p<0.01) associated with students' exam-related self-efficacy, and this relation was found to be partially mediated by the students' perceived stress (β=-0.30, p<0.01).Using adequate coping strategies (i.e., rational coping) may help to reduce stress for dental students and, through their effect on exam-related self-efficacy appraisals, contribute to improved academic performance.[19]

On the other hand, the employment of avoidant coping strategies has resulted in a sub-par academic performance.[19,20] The annual professional examinations are an extremely stressful period for any medical student. All students from year one to five must undergo these examinations to progress. Furthermore, these examinations are the most significant measure of academic achievement for these students. This study will help to identify ideal stress coping strategies and an appropriate amount of LTPA that is needed to improve academic achievement.

Materials and Methods

Study Design and Duration:
It is a cross-sectional study done during August 2019 to November 2019 through simple random sampling technique.

Sample Size:
The following simple formula was used for calculating the adequate sample size:

$$n = Z^2 P(1-P)/d^2$$

Where n is the sample size, Z is the statistic corresponding to level of confidence, P is expected prevalence and d is precision (corresponding to effect size). In our study sample size was 381, with Z= 1.96 at 95% Confidence Interval (CI), P=54%[23] and d=5%.

Participants:
Students enrolled in Bachelor of Medicine, Bachelor of Surgery (MBBS) studying at Rawalpindi Medical University (RMU), Pakistan participated during the period of their professional examination. Printed questionnaires were distributed among all five-year students during their respective examination periods through consecutive sampling. Each participant signed an informed consent form before undertaking the questionnaire. Only MBBS students of RMU and age greater than 18 years old were included in this study. Detained and/or migrated students and those with incomplete forms were excluded from the study. Out of 500 forms distributed, 459 were correctly filled, giving a correct-response rate of 91.8%. High achievers were defined as those with average scores greater than 70% (and distinction, if any). Those with scores less than 70% (and supplementary exams taken if any) were classified as low achievers.

Instruments and Scales:
A self-structured and self-administered questionnaire was used having three parts; 1) socio-demographic and academic status questionnaire, 2) Brief COPE Scale, and 3) Godin Leisure-Time Exercise Questionnaire. The socio-demographic details included age, gender, boarder or non-boarder while the academic status part consisted of year of study, average professional exam scores, number of distinctions (if any) and number of supplementary examinations taken.

The Brief COPE Scale consists of 28 items to measure 14 different coping strategies.[24] The 14 dimensions of coping strategies are self-distraction, active coping, denial, substance abuse, emotional support, use of instrumental support, behavioral disengagement, venting, positive reframing, planning, humor, acceptance, religion, and self-blame. Each dimension contains two items, and each item was scored from 1-4 (depending upon how frequently they employed a particular strategy). Finally, the summed score was taken as the total dimension score. The Cronbach's alpha value was found to be 0.800, indicating excellent reliability.

The Godin Leisure-Time Exercise Questionnaire[25] was used to measure students' leisure-time exercise habits. Using one of the response options (0, none; 1, 1-3 times a week; 2, 4-6 times a week; 3, 7 times a week or more), students were asked to indicate the number of times they engaged in mild, moderate, and strenuous leisure-time exercise bouts of at least 15 minutes of duration in a typical week; examples of such activities were provided for each intensity category. The number of episodes at each intensity level was then multiplied by 3, 5, and 9 metabolic equivalents (for mild, moderate, and strenuous activity, respectively) and summed to derive a leisure-time exercise score for each student. Students were then grouped into Active,

Moderately Active, and Sedentary according to Godin scale scores.25 Cronbach's alpha value was found to be 0.707, indicating an acceptable reliability.

Statistical Analysis:
An Independent t-test was applied for statistical analyses. In all statistical analyses, P-values less than 0.05 were accepted as statistically significant. Independent sample t-tests were used to identify differences between the two academic groups (high and low achievers) by coping strategies, and effect size (Cohen's d) was calculated for each coping skill. Cohen's d was calculated to determine the strength of association between the means. The Cohen's d cut-off values were considered as small (≥0.2), medium (≥0.5), and large (≥0.8). The Spearman's rho test test was applied to find correlation between leisure time activity and academic status of students.

Ethical Statement:
Written permission was taken via email for using Godin Leisure-Time Exercise Questionnaire while Brief Coping Inventory is in the public domain. The synopsis was presented to and approved by the Ethical Review Board of Rawalpindi Medical University. Each participant signed an informed consent form before undertaking the questionnaire. All the authors do not have any conflict of interest.

Results

The mean age was 21.9 (SD=1.70) years. The majority were females 259 (56.4%) as compared to males 200 (43.6%). The response rate was 91.8%. Out of 459 students, 225(49%) were high achievers, while 234(51%) were low achievers. Table-I shows demographic details of students:

Table-I Demographic details of students (n=459)

Characteristics		Low Achievers (n=234)	High Achievers (n=225)	Total
		n (%)	n (%)	n (%)
Gender	Male	82 (41)	118 (59)	200(43.6)
	Female	152 (58.69)	107 (41.31)	259(56.4)
Boarding Status	Yes	126 (56.54)	142 (43.46)	268(58.4)
	No	108(47.1)	83 (52.99)	191(41.6)
Year of Study	1st Year	45(52.94)	40 (47.06)	85(18.5)
	2nd Year	42(45.65)	50 (54.35)	92(20)
	3rd Year	50(48.54)	53 (51.46)	103(22.4)
	4th Year	55(55.56)	44 (44.4)	99(21.6)
	Final Year	42 (52.5)	38 (47.5)	80(17.4)

Coping Strategies
An independent-samples t-test comparing the mean scores of Coping strategies; Approach coping (t (457) =2.835, P<0.05) and avoidant coping (t (457) =-2.17, P<0.05), found a significant difference between the means of the two groups. The mean scores of approach coping (mean=30.80, SD=5.32) were significantly higher for high achievers. By comparison, the mean scores of avoidant coping (mean=48.75, SD=4.92) were considerably higher for low achievers.

1) Approach Coping
Students with higher grades had statistically higher mean scores for Active coping, emotional support, and planning comparatively. Table-II shows a high achiever and low achiever group using coping styles (as per the Brief COPE Scale).

Table-II Mean scores of Approach Coping and its subscales

Strategies	High achievers Mean (S.D)	Low achievers Mean (S.D)	t (df)	P-value	Cohen's d-value
Approach Coping	30.80 (5.31)	29.79 (5.46)	2.01	0.045b	0.188
Active Coping	4.21 (1.10)	3.98 (1.01)	(457)	0.020b	0.218c
Emotional Support	3.79 (1.16)	3.58 (1.08)	2.34	0.041b	0.191
Use of informational support	5.00 (1.69)	4.94 (1.76)	(450.6)	0.710	0.035
Positive Reframing	5.62 (1.60)	5.53 (1.65)	2.05	0.543	0.057
Acceptance	5.89 (1.46)	5.83 (1.41)	(457)	0.678	0.039
Planning	6.26 (1.53)	5.92 (1.44)	0.37	0.014b	0.230c

an Equal variance not assumed, b indicates to a significance level of 0.05, c indicates a small size of effect.

2) Avoidant Coping

In avoidant coping styles, denial, substance use, and self-blame were statistically greater in low achievers than high achievers. In contrast, venting and self-distraction were relatively equally prevalent in both high and low achievers and, as such, were not found to have a remarkable effect on exam scores.

Table-III Mean scores for avoidant coping subscales

Strategies	High Achievers Mean (S.D)	Low Achievers Mean (S.D)	t(df)	P-value	Cohen's d-value
Avoidant Coping	47.69 (5.51)	48.75 (4.92)	-2.17(457)	0.03[b]	0.201[c]
Self-distraction	7.08 (1.58)	7.01 (1.55)	0.46(457)	0.647	0.043
Denial	3.26 (1.54)	2.98 (1.37)	2.02(446.5)[a]	0.044[b]	0.189
Substance use	8.21 (1.16)	8.41 (1.00)	-1.98(457)	0.047[b]	0.185
Behavioral disengagement	8.98 (1.23)	9.15 (0.97)	-1.7(457)[a]	0.090	0.159
Venting	7.59 (1.54)	7.69 (1.54)	-0.67(457)	0.501	0.063
Self-blame	7.09 (2.02)	7.47 (1.91)	-2.05(457)	0.041[b]	0.192

[a]n Equal variance not assumed, [b] indicates to a significance level of 0.05, [c] indicates a small size of effect.

3) Humour and Religion

Humour and religion are neither Approach nor Avoidant coping strategies. It was found that humour scores were significantly higher, t (450.1) = 2.34, P<0.05, in the high achievers (mean = 4.36, SD=1.96) than in the low achievers (mean = 3.95, SD=1.80). There was no significant difference in the mean scores for religion between the two groups under study.

Leisure-time Physical Activity

The mean total leisure activity score calculated through The Godin Leisure-Time Exercise Questionnaire was 28(SD=32.79). A total of 154(66%) students with moderately active life-style were high achievers. On the other hand, 131(85%) students with sedentary lifestyle were low achievers. A weak positive correlation was found between moderate activity (r (2) = .130, P< .001), and an academic status indicating a significant linear relationship between the two variables. Hence, moderately active students scored more. On the other hand, a weak negative correlation was calculated for sedentary/insufficiently active (r (2) =0.114, P=0.015) and academic status. Thus, inactive students scored less. On the other hand, high activity level was not significantly correlated with academic performance.

Discussion

In our study, the level of Leisure-time Physical Activity (LTPA) was the first variable under study. It was found that those having an intermediate level of LTPA had significantly higher scores in their exams, while the sedentary students scored less (P<0.05). This is probably due to the beneficial effects exercise has on our mental capacities, as discussed in a variety of literature such as a study by Bellar et al. which found a similar significant positive relationship between aerobic exercise and academic performance among nursing students in the U.S.[17]

Our study showed no relation between a high level of LTPA and academic performance. This effect seems intuitive; increased exhaustion and loss of study time could counter the beneficial effects of exercise. The loss of study time with increased physical activity is further supported by the results obtained by Turbow. [26] However, further study is needed in this regard.

Stress coping strategies are broadly divided into two categories, i.e., Approach and Avoidant. The results of our studies showed a significant relationship between the type of coping strategy employed by students and their academic performance.

A significant relation (*P*<0.05) was found between students employing approach-based coping mechanisms during their professional exams and performing well. Crego et al. found similar results in their study, which showed approach (rational) coping styles positively affecting self-efficacy, resulting in better academic outcomes.[19] Ziaee conducted another study among Midwifery students in Iran, which supported the consensus that employing approach style coping strategies led to better stress management and improved performance in exams.[20]

Of note among these strategies was Active Coping, Emotional Support, and Planning, all of which had P <0.05. Emotional support was found to positively correlate with academic performance in a study by Wentzel et al.[21], thereby supporting the finding that

students who sought it during stressful examinations were better able to handle the situation and perform well. Similarly, Greiner et al. reported that students trained in systematic planning and active coping measures (such as self-monitoring) excelled over other students who previously they were on par with.[22]

However, the use of instrumental support, positive reframing, and acceptance failed to affect academic performance ($P>0.05$) significantly. This shows that although they may be valuable tools to deal with other sources of stress in one's life, their efficacy in improving academic performance in medical students is limited. Acceptance refers to accepting the situation that causes stress and moving on. Thus, it can be seen how this would be of little use when one is concerned about their academic performance. Similar problems arise regarding the use of positive reframing as well. Merely looking at one's situation in a positive light does not go a long way in improving results, as is evident in our findings.

According to our findings, low achievers used avoidant strategies significantly more than high achievers ($P<.05$). These findings are supported by the results reported by Crego et al.[19] and Ziaee et al.[20], corroborating the notion that the use of avoidant coping mechanisms adversely affects the ability to handle stress and, ultimately, academic performance.

Among the several different avoidant strategies, denial, substance use, and self-blame were the ones that significantly affected grades ($P<0.05$). The relationship between substance abuse and low academic performance is widely documented.[27] While studying self-handicapping, Zuckerman et al. also found out that self-handicappers usually employ denial and self-blame, consequently leading to poor academic performance.[28] He also found behavioral disengagement to be a significant factor, while in our study, this was not the case.

Our study showed a significant relationship between humor and academic performance. This contrasts with the results obtained by Stewart et al., which showed a modest negative correlation.[29] We also found no significant association between religiousness and better academic performance. This is supported by the findings reported by Henning et al.[30]

As promising as the results are, a few limitations must be kept in mind. Although our sample size was adequately large, the main limitation of this study was that medical students from just a single medical university were included, which means that it is possible that our sample is not a true representative of our target population. The inclusion of students from a wide variety of colleges of different geographical locations could lead to results that could then be generalized for the entire community. Furthermore, in our study, we have looked at just two of the factors that could be responsible for the variance in academic performance. Further investigation into possible factors that could either affect academic achievement individually or mediate the effects of the variables under discussion is required. Lastly, as this was a cross-sectional study, all of their inherent drawbacks are applicable. A longitudinal study measuring the academic achievement before and after the employment of different levels of physical activity and various coping styles can go a long way in accurately quantifying their effects.

Conclusion

Despite all the limitations, our study shows the merit of physical activity and approach-based coping styles to improve academic performance. A medium level of leisure-time physical activity and the use of active coping, emotional support, and diligent planning have shown to have considerable positive effects on performance. Similarly, letting go of avoidant coping mechanisms, i.e., denial, substance abuse, and self-blame, etc. positively affect academic performance as well.

Acknowledgment

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