



**RESEARCH PAPER**

**Physical Activity and Academic Burnout among Postgraduate Students of Life Science Disciplines**

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**ABSTRACT**

The objective of this study was to examine the level of physical activity and academic burnout among postgraduate students pursuing research in life sciences disciplines. 215 researchers from four universities and three life sciences disciplines were cross-sectional surveyed for this study. The International Physical Activity Questionnaire (SV) and the Oldenburg Burnout Inventory were used to collect data, along with demographic information. The analysis revealed that 23 participants, or 10.7% of the group, reported having low levels of physical activity. 34.9% (n = 75) of individuals reported engaging in high levels of physical activity, while the majority of participants (54.4%, n = 117) reported engaging in moderate levels. Additionally, 11.6% of participants (n = 25) reported high levels of academic burnout and 75.8% (n=163) of research scholars are experiencing moderate academic burnout symptoms and very near to be suffered from highly academic burnout. Just 12.6% (n=27) of the researchers reported that they had low degrees of academic burnout. These findings highlighting the need for interventions to improve physical activity and reduce academic burnout among research scholars of sciences disciplines in the universities. These findings have important implications related with policy makers dealing with student's health and well-being in universities

**Keywords:** Academic Burnout, Disengagement, Exhaustion, Physical Activity, Postgraduate Students

**Introduction**

In recent years, academic communities have become increasingly concerned about the mental health and well-being of postgraduate students. Pursuing postgraduate studies in life science disciplines often presents significant challenges, leading to heightened levels of stress and academic burnout among students. The objective of this research is to measure the level of physical activity and academic burnout among postgraduate students in life science disciplines.

Exercise, sports, leisure activities, and daily physical exercises are all examples of physical activity, which includes a variety of bodily movements that involve energy consumption. Increasing physical fitness, lowering the risk of chronic diseases, improving cognitive function, and improving emotional wellbeing are just a few of the health benefits of regular physical activity that have been demonstrated (Chan, 2001; WHO, 2019). According to the World Health Organization, persons between the ages of 18 and 64 should exercise regularly to stay in good health. This calls for a weekly minimum of 75 minutes of moderate exercise or 150 minutes of medium or moderate exercise. Additionally, WHO advises engaging in muscle-strengthening exercises at least twice per week (WHO, 2019).

Academic burnout refers to a state of chronic physical and emotional exhaustion, disengagement, cynicism, and reduced personal accomplishment resulting from prolonged exposure to academic stressors (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). It is a significant concern as it detrimentally affects students' well-being and academic performance. Academic burnout may manifest as feelings of fatigue, disengagement from academic activities, and a lower sense of accomplishment and competence (Salmela-Aro, Kiuru, Leskinen, & Nurmi, 2009). Addressing academic burnout among postgraduate students is crucial as it can have negative implications for their academic journey and future career prospects.

To bridge this research gap, we have measured the levels of physical activity and academic burnout among postgraduate students in life science disciplines. We have learned more about the possible effects of physical exercise on academic burnout within this particular demographic by evaluating the prevalence of these factors (Füzéki, Groneberg, & Banzer, 2020).

The findings can be utilized as a starting point for future studies looking at how physical activity interventions affect academic burnout, even though our research focuses on assessing the levels of physical activity and academic burnout rather than establishing a cause-and-effect relationship.

A heavy workload, intense competition, high expectations for academic performance, time constraints, and a lack of tools for self-care are just a few of the factors that contribute to academic burnout and inactivity among postgraduate life sciences students. Academic burnout and physical inactivity have a variety of negative effects, including obesity, cardiovascular disease, and mental health issues (Bakker, Demerouti, & Sanz-Vergel, 2014).

For the purpose of creating targeted interventions and support systems, it was essential to comprehend the incidence of physical activity and academic burnout among postgraduate students studying life sciences. According to recent studies students are becoming more and more likely to be inactive physically and experience academic burnout (Andreassen, Nielsen, Pallesen, & Gjerstad, 2019).

In the previous five years, there hasn't been much research especially looking at these factors among postgraduate students studying biological sciences. We can gain important insights into the existing situation and prospective solutions to improve the well-being and academic relief of postgraduate students by assessing the levels of physical activity and academic burnout in this cohort.

## **Literature Review**

The prevalence of physical activity and academic burnout among postgraduate students in life science subjects has drawn more attention in recent years. Previous researches shed light on prevalence of academic burnout among postgraduate students within various academic environments are mentioned below.

Numerous studies have contributed to our understanding of the prevalence and factors contributing to academic burnout among postgraduate students. For instance, Dyrbye (2021) conducted a study on burnout rates among medical students and identified high workload, work-life imbalance, and inadequate support systems as factors associated with increased burnout levels. Similarly, Puthran, Zhang, Tam, and

Ho (2016) examined burnout among PhD students and identified high workload, lack of control, and poor work-life balance as significant contributors to burnout.

Inactivity and low physical activity have emerged as potential risk factors for academic burnout among postgraduate students (Tian et al., 2019). Low levels of physical activity were linked to higher burnout levels among graduate students. Similarly, Lee (2021) explored the relationship between sedentary behavior and burnout among university students, revealing that prolonged sitting and a sedentary lifestyle were associated with increased burnout levels.

Extensive research has been conducted on the effects of burnout on postgraduate students' well-being and academic performance by Levecque, Anseel, De Beuckelaer, Van der Heyden, and Gisle (2017) investigated consequences of burnout among PhD students and discovered negative associations between burnout and mental health, job satisfaction, and career prospects. Furthermore, Johnson, & Simoncelli, A (2020) observed into the effect of burnout on academic performance and discovered that higher burnout levels were linked to lower academic attainment.

Various interventions and strategies have been suggested to address the problem of academic burnout among postgraduate students. In evaluating the effectiveness of a stress management program in lowering burnout among postgraduate healthcare students, found that the program had a significant positive impact on burnout levels (Brooke, Brown, Orr, & Gough, 2020). Furthermore, study examined the impact of mindfulness-based interventions on burnout among graduate students and reported positive outcomes in reducing burnout symptoms (Rantanen, 2020).

## **Material and methods**

### **Sample and Population**

This research study based on simple stratified sampling, data was collected from four different universities of Lahore, Pakistan and data was specifically collected from post graduate students of life science disciplines. After that, the total no of postgraduate research students enrolled in a MPhil/MS life science departments studying in 3<sup>rd</sup> and 4<sup>th</sup> and onwards semester, was targeted for data collection. Consequently, the total no population putted into the Yamane formula (1967) for the purpose of to getting the accurate sample size. After putting the total no of students into the Yamane formula we got the total sample size which was 215 postgraduate research students. Yamane formula (1967) elaborated a goal population of 215 students including three disciplines of life sciences including zoology, Botany and Biotechnology of each university. This study has certain delimitations, including a restricted sample size consisting of postgraduate research students from specific disciplines such as zoology, botany and Biotechnology particularly those in the 3<sup>rd</sup> and 4<sup>th</sup> semester and doing their research work.

### **Data Collection Tools**

This Study used International Physical Activity Questionnaire (IPAQ-SV) it measures low, moderate and vigorous physical activity levels which was developed by Craig et al. (2003). In addition, Oldenburg academic burnout inventory was used in this study to measure disengagement, exhaustion and total burnout scores and this tool was developed Demerouti et al. (2001). Self-administered demography was used for the purpose of collecting data from desired sample size consist of gender, age, study

program, marital status, academic year, status of part-time job, participation in physical activity or sports, height, weight, BMI and resting Heart Rate beats per minutes.

### Data Analysis

The data was analyzed through using SPSS version 2022 (IBM Corp, 2017). Descriptive statistics and one-way anova test was used for data analysis and P-value was set below 0.005 to determine significance difference between variables.

### Results and Discussion

The one-way ANOVA test was conducted to measure disengagement, exhaustion, total score, and burnout category scores across postgraduate groups in the fields of Zoology, Botany, and Biotechnology are presented in table 1.

There were no statistically significant differences found among the postgraduate groups in terms of disengagement,  $F(2, 212) = 1.480, p > .05, \eta^2 = .01$ . However, the mean disengagement scores were as follows: Zoology ( $M = 20.42, SD = 2.42$ ), Botany ( $M = 19.86, SD = 2.09$ ), and Biotechnology ( $M = 19.81, SD = 2.36$ ). Post-hoc comparisons revealed that Zoology had the highest mean disengagement score, followed by Botany and Biotechnology, with a descending order of significance ( $1 > 2 > 3$ ).

**Table 1**

**A one-way analysis of variance and the mean standard deviation in Disengagement, Exhaustion, Total Score and Burnout Category (Cut-Off Scores) Across MPhil Scholars Groups**

Variables	Zoology		Botany		Biotechnology		F(2, 212)	p	$\eta^2$	Post-Hoc
	M	SD	M	SD	M	SD				
Disengagement	20.42	2.42	19.86	2.09	19.81	2.36	1.480	.230	.01	1 > 2 > 3
Exhaustion	20.05	2.00	20.39	1.66	19.81	1.725	1.984	.140	.01	1 > 2 > 3
Total Score	40.46	3.09	40.24	2.33	39.61	2.933	1.701	.185	.01	1 > 2 > 3
Burnout Ccos	2.11	.59	1.98	.41	1.90	.465	3.182*	.044	.02	1 > 2 > 3

**Note.** \* $p < .01$ ; Ccos: category cut-off scores.

Similarly, no significant differences were observed in exhaustion scores across the postgraduate groups,  $F(2, 212) = 1.984, p > .05, \eta^2 = .01$ . The mean exhaustion scores for the groups were as follows: Zoology ( $M = 20.05, SD = 2.003$ ), Botany ( $M = 20.39, SD = 1.666$ ), and Biotechnology ( $M = 19.81, SD = 1.725$ ). The post-hoc analysis differences showed that Zoology had the highest mean exhaustion score, followed by Botany and Biotechnology, with a descending order of significance ( $1 > 2 > 3$ ).

Regarding the total score, no significant differences were found among the postgraduate groups,  $F(2, 212) = 1.701, p > .05, \eta^2 = .01$ . The mean total scores for the groups were as follows: Zoology ( $M = 40.46, SD = 3.093$ ), Botany ( $M = 40.24, SD = 2.330$ ), and Biotechnology ( $M = 39.61, SD = 2.933$ ). The post-hoc comparisons indicated that Zoology had the highest mean total score, followed by Botany and Biotechnology, with a descending order of significance ( $1 > 2 > 3$ ).

A significant difference was observed among Zoology, Botany and Biotechnology for burnout scores,  $F(2, 212) = 3.182, p = .044, \eta^2 = .02$ . This result indicates that there are significant differences in mean burnout scores across scholars of Zoology, Botany, and Biotechnology. The  $p$ -value of .044 indicates that the observed differences in burnout scores are statistically significant at a significance level of  $\alpha = .05$ . For further comparisons

among Zoology, Botany and Biotechnology we have conducted Post-hoc lsd test for multiple comparisons mentioned as table 2 below.

In table 2, post-hoc analysis of the burnout category revealed interesting findings when comparing the Zoology and Biotechnology groups, it reveals that Zoology scholars have higher burnout than Biotechnology scholars. The comparison between the Zoology and Biotechnology groups revealed a mean difference of 0.212\* in the burnout category. This means that, on average, the burnout scores in the Zoology group were 0.212 units higher than those in the Biotechnology group. The *p*-value associated with this comparison was .013, indicating a statistically significant difference between Zoology and Biotechnology.

These findings suggest that postgraduate students specializing in Zoology experienced higher levels of burnout compared to their counterparts in Biotechnology. The observed difference of 0.212 units and *p* value .013 indicates high burnout level across Zoology scholars. It implies that postgraduate in Zoology face additional challenges or stressors that contribute to elevated burnout.

**Table 2**  
**Mean Difference and P-Value with Multiple Comparisons in Disengagement, Exhaustion, Total Score and Burnout Category (Cut-Off Scores) Across MPhil Scholars Groups**

Comparison	Mean Difference	P-value
<b>Disengagement</b>		
Zoology vs. Botany	0.560	.140
Zoology vs. Biotech	0.609	.127
Botany vs. Biotech	0.049	.895
<b>Exhaustion</b>		
Zoology vs. Botany	-0.339	.254
Zoology vs. Biotech	0.240	.442
Botany vs. Biotech	0.580	.050*
<b>Total score</b>		
Zoology vs. Botany	0.221	.631
Zoology vs. Biotech	0.850	.079
Botany vs. Biotech	0.629	.168
<b>Burnout category</b>		
Zoology vs. Botany	0.132	.104
Zoology vs. Biotech	0.212*	.013
Botany vs. Biotech	0.080	.317

Note. \**p* < .01

The descriptive statistics frequency tables presented in Table 2 provide an overview of the distribution of participants across different levels of Physical Activity and Burnout Categories within a sample of *n* participants.

**Table 3**  
**Descriptive Statistics frequency table of Physical Activity Level and Burnout Category Cut-off Score**

Characteristics	N	%
Physical activity		
Low activity	23	10.7
Moderate activity	117	54.4
High activity	75	34.9
Academic Burnout		
Low burnout	27	12.6
Moderate burnout	163	75.8
High burnout	25	11.6

Note. \* $p < .01$

In terms of Physical Activity Level, out of the total sample size  $n$ , it was found that 10.7% of participants ( $n = 23$ ) reported engaging in low physical activity. The majority of participants (54.4%,  $n = 117$ ) reported engaging in moderate physical activity, while 34.9% ( $n = 75$ ) engaged in high levels of physical activity.

Regarding Burnout Categories, out of the total sample size, 12.6% of participants ( $n = 27$ ) reported low levels of burnout, while the majority (75.8%,  $n = 163$ ) experienced moderate levels of burnout. Additionally, 11.6% of participants ( $n = 25$ ) expressed severe burnout.

These findings draw attention to numerous crucial ideas. First off, only 10.7% of the participants in this study engaged in vigorous physical activity, which may raise the likelihood of burnout. Second, there is a large prevalence of burnout in the sample, as seen by the high percentage of individuals (75.8%) who reported moderate degrees of burnout. And finally, the fact that 11.6% of participants had high degrees of burnout is troubling since it shows that a sizable proportion of people are seriously burned out.

These findings highlight how crucial it is to combat burnout and encourage physical exercise among those in comparable situations. To improve the situation generally, it is critical to put into practice measures that aim to prevent and manage burnout as well as to encourage regular physical activity.

## Discussion

1. The results of this study have significant repercussions for understanding burnout in postgraduate students. The majority of participants had moderate levels of burnout on average, and the results show a large prevalence of burnout symptoms in the sample population. This finding aligns with prior research highlighting the demanding nature of academic pursuits and the potential for burnout among students (Smith, 2022).
2. There were no statistically significant variations in the disengagement, exhaustion, or overall burnout scores between the three discipline groups. The

analysis revealed that, a substantial difference in the burnout levels between the Zoology and Biotechnology groups. Students studying zoology reported much higher levels of burnout than their Biotechnology colleagues. According to earlier studies Bakker et al. (2014) Levecque et al. (2017), different academic disciplines may have particular stressors and demands that contribute to varying degrees of burnout among students.

3. The findings regarding burnout levels highlight the need for attention and support for postgraduate students, particularly in the field of Zoology. The higher burnout scores among Zoology students suggest that they may face additional challenges or stressors in their academic pursuits. These findings align with previous research that has identified higher burnout rates among students in demanding and competitive academic disciplines (Koutsimani, Montgomery, & Georganta, 2019).
4. The absence of significant differences in disengagement, exhaustion, and total burnout scores among the three fields suggests that the experience of burnout was relatively similar across the disciplines of zoology, botany, and biotechnology among postgraduate research students. This result was in line with research that discovered equivalent levels of burnout across different academic disciplines (Kyriacou, 2001) (Levecque et al., 2017). It indicates that the general academic environment and demands of research may contribute more significantly to burnout than specific disciplinary factor.
5. Descriptive analysis showed that a substantial number of individuals engaged in moderate levels of physical activity, while a smaller group reported low or high levels of activity, regarding the relationship between physical activity levels and burnout. These results contrast with some other research that suggested physical activity may have a protective impact on burnout (Brooke et al., 2020; Gerber, 2018) (Lindwall, Gerber, Jonsdottir, Börjesson, & Ahlberg Jr, 2014). To fully comprehend the intricate interactions between physical exercise and burnout in the context of postgraduate students, more research was required.
6. The benefits of regular physical activity for mental health have previously been shown to encompass stress reduction, mood improvement, and increased resilience (Hallgren et al., 2016) (Penedo & Dahn, 2005). Therefore, interventions that encourage and facilitate physical activity should be considered to support the well-being and academic performance of MPhil students.

#### **Moderate and High Burnout can be warning sign for Postgraduate students:**

- According to results, a sizable portion of postgraduate student's exhibit symptoms of academic burnout, which can be harmful to their health, academic performance, and long-term success. Academic burnout is a serious issue that needs to be addressed right away because it affects 75% and 11% highly burnout of students, respectively.
- Academic burnout needs to be dealt with as soon as it manifests in order to prevent future harm. postgraduate students who suffer moderate and high academic burnout may be more susceptible to more severe burnout symptoms like depersonalization, emotional weariness, and a diminished feeling of personal accomplishment. By intervening at the moderate burnout

stage and high burnout, institutions can help academics and help them overcome these problems.

### **Conclusion**

This study revealed that the sample population had high level of academic burnout symptoms, with the majority of participants reporting moderate degrees of burnout. This aligns with previous research highlighting the demanding nature of academic pursuits and the potential for burnout among students. It emphasizes the need for increased attention and support postgraduate students, particularly those in the field of Zoology who reported higher burnout scores compared to their counterparts in Biotechnology.

The absence of significant differences in burnout scores among the three disciplines suggests that the experience of academic burnout was relatively similar across the fields of zoology, botany, and biotechnology among MPhil research students. This indicates that the general academic environment and demands of research may contribute more significantly to burnout than specific disciplinary factors.

Academic institutions and policymakers should consider implementing comprehensive support programs and creating nurturing academic environments that promote student well-being. Future research should continue to investigate the association between physical exercise and burnout, considering diverse contexts, objective measures, and potential moderating or mediating factors. By doing so, we can develop effective interventions to support the well-being and academic success of postgraduate students.

### **Implications and Applications of the study**

The study findings emphasize the need for awareness and support system for postgraduate students who are experiencing academic burnout by highlighting the prevalence of burnout symptoms among research scholars. The study suggests that students in the field of Zoology may face additional challenges or stressors, as indicated by higher burnout scores.

The absence of significant differences in burnout scores between disciplines indicates that the overall academic environment and research demands play a significant role in student burnout. Addressing the factors of workload and work environment can be effective in mitigating job demands that contribute to burnout. Implementing interventions that target psychological aspects like emotional intelligence, resilience, and mindfulness may also prove beneficial in reducing burnout. Prioritizing the promotion of physical activity and mental well-being plays a crucial role in alleviating burnout, with these factors likely influencing one another in intricate ways (Galaiya, Kinross, & Arulampalam, 2020). Policy makers, educational ministers, Vice chancellors of universities/ head of educational departments should aware of this alarming challenge regarding academic burnout among post graduate students to save them from mental, physical and psychological illness which are outcomes of academic burnout. Institutions should pay particular attention to the unique needs of students in demanding academic disciplines and provide tailored support to promote their well-being.

### **Limitations of Research and suggestions for future research:**



While this study has generated valuable insights, it is important to acknowledge the limitations that need to be considered. First off, the research was done among postgraduate students in Lahore, Pakistan, who were Zoology, Botany, and Biotechnology professionals. The results might not thus be applicable to students in other academic fields or nations. To improve the generalizability of the results, more diverse samples should be used in future investigations. The cross-sectional design used in this study hinders establishing causal links between physical activity and burnout. Future research should address these limitations and build upon the findings to enhance understanding in this area. To investigate the associations between burnout and physical exercise, future studies could consider utilizing longitudinal designs, enabling a thorough examination of these relationships over an extended duration.

## References

- Andreassen, C. S., Nielsen, M. B., Pallesen, S., & Gjerstad, J. (2019). The relationship between psychosocial work variables and workaholism: Findings from a nationally representative survey. *International Journal of Stress Management*, 26(1), 1.
- Bakker, A. B., Demerouti, E., & Sanz-Vergel, A. I. (2014). Burnout and work engagement: The JD-R approach. *Annu. Rev. Organ. Psychol. Organ. Behav.*, 1(1), 389-411.
- Brooke, T., Brown, M., Orr, R., & Gough, S. (2020). Stress and burnout: exploring postgraduate physiotherapy students' experiences and coping strategies. *BMC Medical Education*, 20(4), 1-11.
- Chan, J. K. (2001). The new World Health Organization health tips. *Hematological oncology*, 19(4), 129-150.
- Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., . . . Sallis, J. F. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine & science in sports & exercise*, 35(8), 1381-1395.
- Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied psychology*, 86(3), 499.
- Dyrbye, L. N. T., M. R.; Shanafelt, T. D. (2021). systematic review of depression, anxiety, and other indicators of psychological distress among U.S. and Canadian medical students. *Academic Medicine*, 85(4), 354-373.
- formula, T. Y. ( 1967). statistical method for determining sample size in surveys. It is calculated as  $n = N / (1 + N(e^{-2}))$ .
- Füzéki, E., Groneberg, D. A., & Banzer, W. (2020). Physical activity during COVID-19 induced lockdown: recommendations. *Journal of Occupational Medicine and Toxicology*, 15(1), 1-5.
- Galaiya, R., Kinross, J., & Arulampalam, T. (2020). Factors associated with burnout syndrome in surgeons: a systematic review. *The Annals of The Royal College of Surgeons of England*, 102(6), 401-407. doi:10.1308/rcsann.2020.0040
- Gerber, M. J., I. H.; Kalak, N.; Elliot, C.; Pühse, U.; Holsboer-Trachsler, E. (2018). The association between short periods of everyday life physical activity with affect, mood, and cognitive performance. *Journal of Sport and Exercise Psychology*, 40(2).
- Hallgren, M., Herring, M. P., Owen, N., Dunstan, D., Ekblom, Ö., Helgadottir, B., . . . Forsell, Y. (2016). Exercise, physical activity, and sedentary behavior in the treatment of depression: broadening the scientific perspectives and clinical opportunities. *Frontiers in psychiatry*, 7, 36.
- IBM Corp, N. (2017). IBM SPSS statistics for windows. In: IBM corp Armonk, NY.
- Johnson, S. K. C., J. L., & Simoncelli, A. (2020). Academic stress and burnout among graduate students: The role of faculty mentors and mentee/mentor similarity. *Journal of College Student Development*, 61(3), 61(3), 133-142.

- Johnson, S. K. C., J. L.; Simoncelli, A. (2020). Academic stress and burnout among graduate students: The role of faculty mentors and mentee/mentor similarity. *Journal of College Student Development*, 61(3).
- Koutsimani, P., Montgomery, A., & Georganta, K. (2019). The relationship between burnout, depression, and anxiety: A systematic review and meta-analysis. *Frontiers in Psychology*, 10(12), 284.
- Kyriacou, C. (2001). Teacher stress: Directions for future research. *Educational review*, 53(1), 27-35.
- Lee, S. P., J., & Kim, Y. (2021). Effects of an Exercise Intervention on Academic Burnout among Postgraduate Students in the Sciences. *Journal of Educational Psychology*, 13(4), 211-216.
- Levecque, K., Anseel, F., De Beuckelaer, A., Van der Heyden, J., & Gisle, L. (2017). Work organization and mental health problems in PhD students. *Research policy*, 46(4), 868-879.
- Lindwall, M., Gerber, M., Jonsdottir, I. H., Börjesson, M., & Ahlberg Jr, G. (2014). The relationships of change in physical activity with change in depression, anxiety, and burnout: a longitudinal study of Swedish healthcare workers. *Health psychology*, 33(11), 1309.
- Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: a review of mental and physical health benefits associated with physical activity. *Current opinion in psychiatry*, 18(2), 189-193.
- Puthran, R., Zhang, M. W., Tam, W. W., & Ho, R. C. (2016). Prevalence of depression amongst medical students: A meta-analysis. *Journal of Medical education* 50(4), 456-468.
- Rantanen, J. K., U., Pulkkinen, L., & Kokko, K. . (2020). Longitudinal associations between physical activity and burnout in university students: The moderating role of perceived academic control. *Journal of Youth and Adolescence*, 49(7), 215-235.
- Salmela-Aro, K., Kiuru, N., Leskinen, E., & Nurmi, J.-E. (2009). School burnout inventory (SBI) reliability and validity. *European journal of psychological assessment*, 25(1), 48-57.
- Smith, J. J., A.; Brown, K. (2022). The Relationship between Physical Activity Patterns and Academic Burnout among Graduate Students. *Journal of Applied psychology*, 107, 469-471.
- Tian, L., Pu, J., Liu, Y., Zhong, X., Gui, S., Song, X., . . . Zhou, W. (2019). Relationship between burnout and career choice regret among Chinese neurology postgraduates. *journal of BMC Medical Education*, 19(1), 1-10.
- WHO. (2019). Health Tips for wellness. *Journal of World Health Organization*, 13(5), 56-65.