

Assessing the Impact of High-Intensity Interval Training on Burnout in University Students.

Baljeet Kaur, Moattar Raza Rizvi.

Abstract

Objective: To evaluate the efficacy of high intensity interval training (HIIT) in university students to improve their level of burnout. The students involved in the study are medical and allied health students pursuing the course of physiotherapy, dental and pharmacy courses.

Materials and methods: A total of 145 participants were screened for their level of burnout with Maslach burnout inventory and their general mental wellbeing was assessed with GHQ 12. Out of which 62 students exhibit mild to moderate burnout. There was drop of 2 students. The study was continued with 60 participants. These were randomly allocated to 2 groups using stratified random sampling using lottery method. The intervention group was HIIT group and the other was control group. The intervention group was given a HIIT program for 6 weeks, 5 days/week. And control group was given education with the help of a pamphlet.

Results: The study analyzed burnout and general health for participants before and after the intervention. Burnout was evaluated using its three variables occupational exhaustion (OE), depersonalization (DP), and personal accomplishment (PA). There was significant improvement in all variables within the two groups. OE, DP and GHQ showed more significant increment in intervention group as compared to control group, whereas PA showed a significant decrement in intervention group than control group.

Conclusion: A six-week high intensity interval training program was given to medical students and it was compared with exercise education only. The results strongly suggest the use of HIIT to alleviate the symptoms of burnout

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Introduction

Burnout as a condition was first described by American Psychologist HerberdFreudenberger. He explained this term to understand the problems of people, related to their work or occupation. Initially it was described as overwork, overstress due to work and sometimes related to inefficiency in work.[1] The International Classification of Diseases defines burnout as “A syndrome conceptualized as resulting from chronic workplace stress that has not been successfully managed. It is characterized by three dimensions: feelings of energy depletion or exhaustion, increased mental distance from one’s job, Feelings of negativism or cynicism related to one's job”.[2] The burnout is also explained in university students. A meta-analysis was conducted to study the prevalence of burnout in medical students and suggested that the prevalence is 44.2 %.[3] They also studied the three variables of burnout, which is emotional exhaustion, depersonalization and personal achievement. The percentage prevalence of the 3 variables is 40.8%, 35.1% and 27.4% respectively. The prevalence of burnout in Indian undergraduate students and the result indicate a prevalence of 48.5% of burnout in these students. [4]

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Keywords

Burnout, high intensity interval training, university students, Maslach burnout inventory

Researchers have tried to explore the factors leading to burnout in university students or the factors, which put the students at the risk of developing burn out. The researches has indicated that there is a correlation between low academic performance and burnout, also lack of participation in extracurricular activities is also related to burnout. . [5] The social factors in relation to burnout and concluded that age and sex are not related to development of burnout. [6] It was also found out that factors like marital status, employment status and no. of children and found that these factors are also not associated with burnout. Various correlational studies have been conducted to get in depth knowledge about burnout. The researches have implied that burnout has a negative correlation with academic achievement. [7] A large cross-sectional study was conducted in China in 2023, which explored various factors associated with burnout in university students. The results revealed that not only financial expenses, difficulty level of studies is strongly associated with burnout but also factors like parent education level and smoking in students are also strong factors associated with burnout. [8] During the time of COVID 19 and lockdown researchers explored that long exposure to digital devices and screen and lack of human contact increased the level of burnout [9]

Burnout influences a student not only emotionally but physically and socially also. Burnout can cause stress [10-11], depression and anxiety [12] It can lead to detachment from family members and even suicidal ideation [13] Burnout can also cause drop out from universities and colleges [14] Most importantly, it reduces academic efficacy of students due to which they cannot perform well in their studies and later on at work [15]

Various researchers have emphasized that it is important to identify the symptoms of burnout and assessing it objectively. If we can identify burnout then only, we can help students.. [16, 17] There are various objective measures and questionnaires to assess the level of burnout in different populations. The most commonly used tools are Maslach Burnout Inventory, Burnout Assessment Tool (BAT) [18], Copenhagen Burnout Inventory [19] and Oldenburg Burnout Inventory. [20] In the present study, the researchers have used Maslach Burnout Inventory, as it is one of the first standardized questionnaires used to assess burnout. It has specific student survey version. It is a reliable and valid questionnaire with the Cronbach's alpha for emotional exhaustion is 0.86, depersonalization-0.63, and personal accomplishment-0.72. It is the most widely used burnout questionnaire for research purpose also [21]

Burnout has been studied extensively in literature for people being exhausted at their work place or study place. It has been studied in various populations such as in teachers, students, doctors, nurses and other type of job profiles. Prevalence studies have been rigorously done for burnout in medical students. In addition, in India prevalence studies have been

published to mark the presence of burnout in medical students. [22] The existence of interventional studies for burnout in student is comparatively scarce .[23] After substantial literature review some of the prominent treatment interventions that came out were cognitive behavioral therapy, rational emotive behavioral therapy [24], learning burnout intervention [25], and mindfulness training [26] for students. There is a dearth of evidence regarding effect of physical form of treatment or exercise training to improve burnout in students. However, a correlation between physical activity and burnout has been established [27]. Moreover, it stated that lack of physical activity could lead to higher level of burnout in students.

The present study wants to explore the effects of high intensity interval training on burnout in university students. According to the American College of Sports Medicine, High Intensity Interval Training can be defined as "exercise program where a person's heart rate reaches more than 80% of the person's maximum heart rate" .[28] While performing high intensity exercises it is important to perform exercises with interspersing rest intervals and the ratio commonly recommended by the researchers is 1:1. The use and efficacy of HIIT has found to improve mental health aspects like stress and anxiety in university students.[29] The use of HIIT in university students as it improves their mood and reduces their stress.[30] Nevertheless, the effect of HIIT has not been investigated in university students with burnout therefore the present study wants to explore the effects of HIIT in burnout university students.

Methodology

University students who were pursuing their medical or allied health courses at graduation level like physiotherapy, pharmacy and dental constituted the study population. The data was collected from medical and allied health colleges and University, Delhi NCR. Approval from ethical committee was obtained. A well-informed written consent was taken from subjects. The subjects were included in the study using stratified random sampling using lottery method for group allocation. The students who fulfilled the inclusion criteria were included in the study. The inclusion criteria constituted university students doing medical or allied health courses at graduation level like Physiotherapy, Dental and Pharmacy, Age group 19-25 years, students with presence of burnout using a Maslach Burnout Inventory student survey. If the students had any diagnosed neurological or any other systemic disease, postgraduate students and students doing internship were not included as the current study primarily focuses on student doing their graduation level of medical studies. Students who have been diagnosed with severe

psychological problems and are taking regular medication for it. Students who were already doing any regular form of exercise, yoga, and mindfulness were not included in the study as it can bias the results. Student who showed severe category scores in

Maslach Burnout Inventory were referred to departmental counsellor and appropriate steps were ensured for providing best help to those students.

The subjects selected on the basis of inclusion and exclusion criteria were allocated to two groups using stratified random sampling using lottery method. Group 1 was intervention group and was provided intervention of high intensity interval training, Group 2 was control group. The two groups were assessed on GHQ12 and Maslach Burnout Inventory for Pre-test scores. Group 1 was given HIIT training for 6 weeks, 5 days per week. Exercise protocol includes push-ups, squats, deadlifts, plank, set of 3 for a duration of 30-90 seconds with a rest interval of 15-60 seconds and the progression was done by increasing the exercise time, reducing the rest time or increasing the number of repetitions. Intensity was maintained at 6-9 RPE (rate of perceived exertion) using the Borg’s perceived exertion scale.[31]

Group two was control group, this group was education group only, through a pamphlet regarding daily exercise like deep breathing exercises, a regular walk or jog. The control group was educated about the role of frequent rest intervals and indulging in simple exercises. There was one time interaction of researcher with the subjects of control group. During the interaction they were explained about all the information given in the pamphlet and were handed over the pamphlet. They were also advised that during the study time of 6 weeks if required they can contact or call the researcher. And the control group was informed that from the researcher’s end the next

meeting will be after a period of 6 weeks. Hence, after 6 weeks the two groups were again assessed on GHQ12 and Maslach burnout inventory for their post test scores.

Data Analysis

The statistical analyses were conducted utilizing SPSS software. Descriptive statistics, specifically mean and standard deviation, were computed for both groups across the assessed parameters: Burnout (comprising Occupational Exhaustion [OE], Depersonalization [DP], and Personal Accomplishment [PA]), and the General Health Questionnaire (GHQ). To assess and compare the baseline differences in burnout and general health between the control and HIIT groups, an independent t-test was utilized. Furthermore, for analyzing the pre- and post-intervention scores within each group, a paired t-test was employed. This analytical approach was chosen to determine the statistical significance of changes within the control and High-Intensity Interval Training (HIIT) groups separately, across the aforementioned variables. All statistical tests were conducted at a significance level (alpha) of 0.05, and the results were interpreted within a 95% confidence interval.

Results

The data of the study was analyzed using SPSS software. The group1 (intervention group) and group 2 (control group) were compared based on age and gender. The mean age of the population (n=60) was 21.07 (SD=1.483) years with minimum to maximum of 18-24 years. In the population of 60 students 36 were females and 24 were males.

Table 1: Independent t test showing comparison between control and HIIT group

Outcomes	Control	HIIT	Mean Diff	SE Diff	p	95% CI	
						Lower	Upper
PRE-OE	24.07 ± 3.27	25.17 ± 2.55	1.1	0.76	0.15	-0.42	2.62
POST-OE	23.27 ± 3.14	15.77 ± 2.36	-7.5	0.72	<0.001	-8.94	-6.07
PRE-DP	8.53 ± 1.22	8.60 ± 1.25	0.07	0.32	0.84	-0.57	0.71
POST-DP	7.97 ± 0.93	4.73 ± 0.94	-3.23	0.24	<0.001	-3.72	-2.75
PRE-PA	35.60 ± 1.19	36.47 ± 1.98	0.87	0.42	0.04	0.02	1.71
POST-PA	36.27 ± 1.29	44.63 ± 2.03	8.37	0.44	<0.001	7.49	9.24
PRE-GHQ	24.10 ± 5.96	24.23 ± 5.32	0.13	1.46	0.93	-2.79	3.05
POST GHQ	21.27 ± 5.68	16.07 ± 4.73	-5.2	1.35	<0.001	-7.9	-2.5

burnout [OE -Occupational exhaustion, DP – Depersonalization, PA –personal accomplishment] and GHQ – General Health Questionnaire, HIIT - High Intensity Interval Training

Table 2: Paired t test showing the pre to post comparison within group

Outcome	Group	Pre	Post	Mean	SD	95% CI		t	p
		Mean±SD	Mean±SD	Diff		Lower	Upper		
OE	Control	24.07 ± 3.27	23.27 ± 3.14	0.8	1.38	0.29	1.31	3.19	0.33
	HIIT	25.17 ± 2.55	15.77 ± 2.36	9.4	2.21	8.58	10.22	23.33	<0.00
DP	Control	8.53 ± 1.22	7.97 ± 0.93	0.57	1.1	0.15	0.98	2.81	0.91
	HIIT	8.60 ± 1.25	4.73 ± 0.94	3.87	1.36	3.36	4.37	15.6	<0.00
PA	Control	35.60 ± 1.19	36.27 ± 1.29	-0.67	1.12	-1.09	-0.25	-3.25	0.32
	HIIT	36.47 ± 1.98	44.63 ± 2.03	-8.17	2.55	-9.12	-7.22	-17.56	<0.00
GHQ	Control	24.10 ± 5.96	21.27 ± 5.68	2.83	1.51	2.27	3.4	10.27	0.41
	HIIT	24.23 ± 5.32	16.07 ± 4.73	8.17	2.42	7.26	9.07	18.47	<0.00

burnout [OE -Occupational exhaustion, DP –Depersonalization, PA –personal accomplishment] and GHQ -General Health Questionnaire, HIIT - High Intensity Interval Training

Independent t test

When evaluating the baseline measurements of the

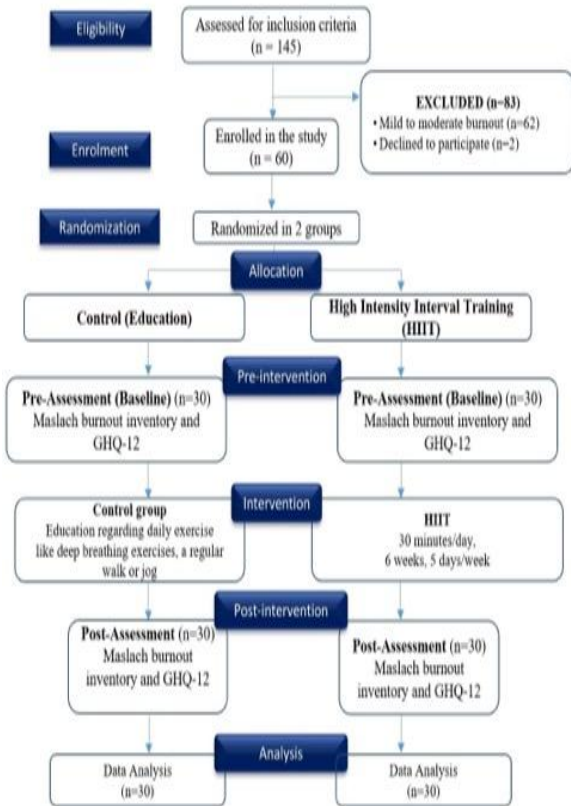


Figure 1: Flow chart of the study

independent t-test between the control group and the High-Intensity Interval Training (HIIT) group, it is evident that there were no significant differences in any of the outcome measures, indicating that both groups were comparable at the start of the study.

Specifically, in terms of Occupational Exhaustion (OE), the control group's score was 24.07 ± 3.27 , while the HIIT group scored 25.17 ± 2.55 , with a mean difference of 1.1 that was not statistically significant ($p = 0.15$). This suggests that initially, both groups had similar levels of occupational exhaustion. Similarly, for Depersonalization (DP), the baseline scores were very close, with the control group at 8.53 ± 1.22 and the HIIT group at 8.60 ± 1.25 , yielding a non-significant mean difference of 0.07 ($p = 0.84$). This indicates that the initial levels of depersonalization were comparable in both groups. Regarding Personal Accomplishment (PA), the control group had a baseline score of 35.60 ± 1.19 compared to the HIIT group's 36.47 ± 1.98 . The mean difference of 0.87, although marginally significant ($p = 0.04$), was not considered substantial enough to indicate a meaningful difference in personal accomplishment levels at the outset. Lastly, in the General Health Questionnaire (GHQ), both groups started off similarly, with the control group scoring 24.10 ± 5.96 and the HIIT group scoring 24.23 ± 5.32 , and a mean difference of 0.13 that was not significant ($p = 0.93$).

Discussion

Mental health has been the point of interest for researchers from the last many years. Mental health problems have been acknowledged in medical student population in various researches. Stress, anxiety,

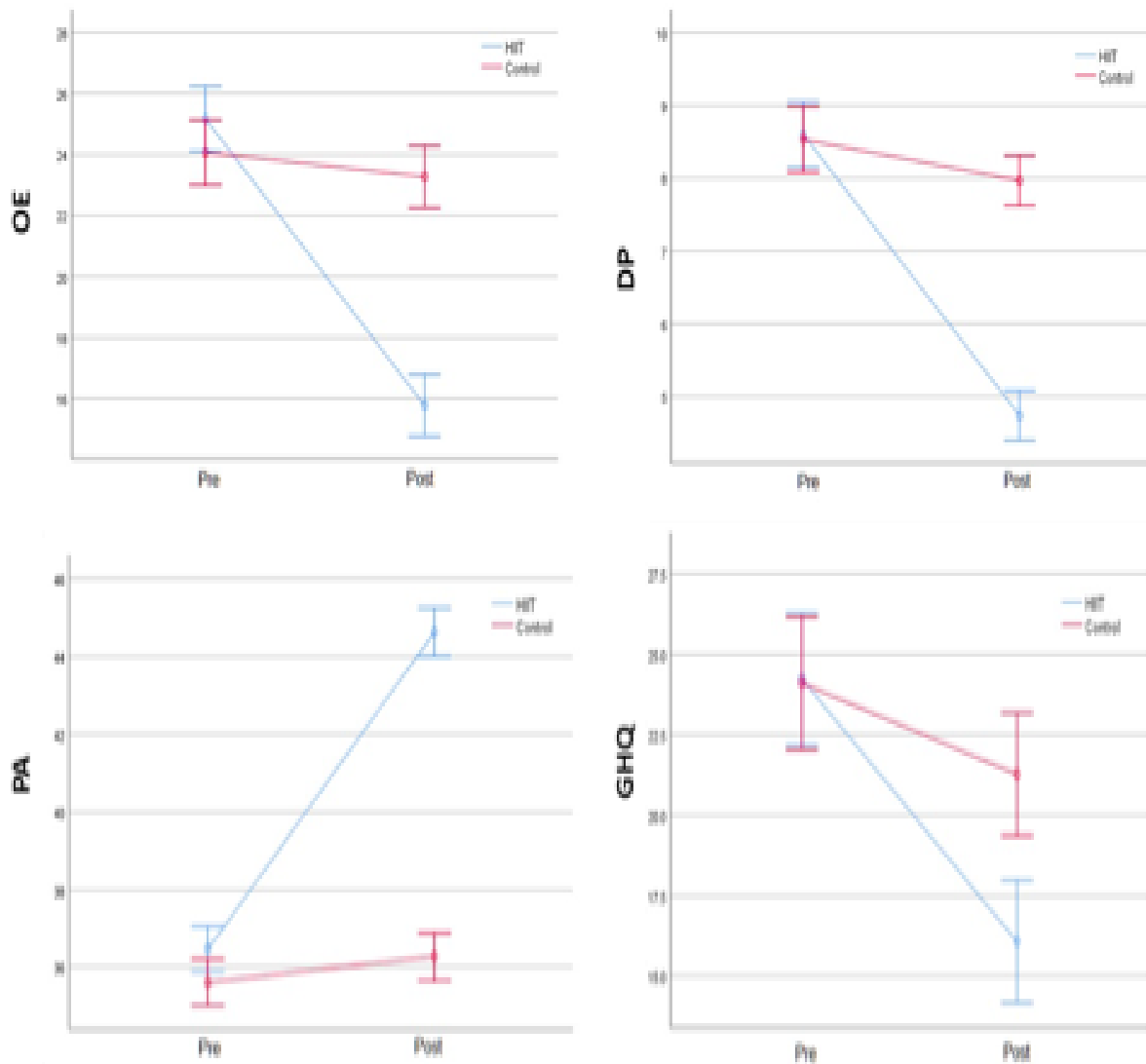


Figure 2: Pre and post comparison of Maslach burnout inventory and GHQ-12

depression, suicidal ideation has been studied extensively. One of the variables studied in this population is burnout. Its prevalence and correlations have been studied in the past researches. Randomized control trials suggesting the use of any form of exercise intervention is lacking. Therefore, the present study aimed to study the efficacy of high intensity interval training for the treatment of mild to moderate burnout in university students pursuing medical and allied health courses. In the present study, HIIT was given under the supervision of certified physiotherapist. The student performed bouts of exercises 5 times for 6 weeks. Therefore, the present study is one of kind randomized control trial where a physical intervention in the form of exercise is used to mitigate burnout. After an intervention of six weeks, the result suggested that HIIT is an effective physical intervention for the treatment of burnout. The results showed significant improvement in occupational

exhaustion (OE), mean values increased showing greater improvements in the intervention group as compared to control group. For depersonalization (DP) the values again increased in both groups but significantly higher in intervention group than control group. In case of Personal accomplishment (PA) the post test scores were higher than the pre test scores indicating improvement in PA. There was significant difference in both groups with group 1 showing more increment in values than group 2. General health questionnaire (GHQ) was the fourth variable indicating mental health of the participants, the test scores decreased in both the groups with greater improvement shown in the intervention group. Thus, high intensity interval training was found to be more effective in reducing burnout and improving mental health in university students. Researches have studied the impact of High intensity interval training in college students Factors like VO2 max, fat and carbohydrate metabolism have been

studied in relation to HIIT and results show that these three variables increase in human body when it undergoes HIIT. [32,33] In a recent study it is suggested that HIIT improves cardiorespiratory and metabolic functions in university students, HIIT increases brain derived neurotrophic factor and cortisol.[30] A systematic review to study Yoga as a treatment strategy for burnout in health care providers including medical students.[34] The results suggested that yoga is effective in reducing burnout and stress levels and improves self-regulation also.[35] In a recent systematic review, the efficacy of different forms of treatment to alleviate burnout was studied. The review implied that interventions like mindfulness and rationale emotive behavior therapy have been effective in reducing burnout in healthcare workers. But the researchers also pointed out that the experiences and stressors are different in healthcare workers and students therefore simple applicability of this treatment to all types of population suffering from burnout is questionable.

Therefore, the present study provided an effective method in the form of physical intervention to alleviate the symptoms of burnout in university students pursuing medical courses. This type of training is easy to perform by young students and no additional specialized equipment is required for conducting exercise sessions. If medical students who are experiencing mild psychological issues especially mild burnout, then they can be helped with high intensity interval training. It can be an adjunct to treatment of moderate to severe form of psychological problems as well.

Limitations of study

The sample selected in the study are from one university but wider geographical area should be covered so that the results can be applicable to wider population.

Clinical relevance

Burnout is one of common causes of reduced efficiency of medical students and professionals. Therefore, it is imperative to conduct regular assessment of burnout in medical students. Moreover, researchers worldwide are working towards evaluation of new treatment interventions to mitigate symptoms of burnout. High intensity interval training has been found to be effective in reducing the symptoms of burnout. It can be given in any simple setting to students and this can help reduce their symptoms of burnout. Thus, we can improve the efficiency of medical students, and therefore their clinical practice.

Future studies

Effects of high intensity interval training can be studied for moderate to severe cases of burnout. Long term effects of HIIT can be studied in cases of burnout. This study analyzed the burnout and mental health but more studies can be conducted to study the effect of HIIT on biochemical markers and neuromodulators.

Conclusion

Burnout is one of commonest psychological issue experienced by medical students. A six-week high intensity interval training program was given to medical students and it was compared with exercise education only. The results strongly suggest the use of HIIT to alleviate the symptoms of burnout.

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Conflicts of interest

There are no conflicts of interest

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