

EFFECT OF HIIT ON NEUROTICISM OF PHYSICAL EDUCATION STUDENTS**S. Munder¹, R. Poonia^{2*} and P.S. Chahar³**^{1,2*}Department of Arts (Physical Education), Manipal University Jaipur, Rajasthan, India,³Department of Physical Education, Banaras Hindu University, Varanasi, India, Email:¹squash.racket04@gmail.com, ^{2*}reenapoonia23@gmail.com, ³pradeepchahar84@gmail.com**ABSTRACT**

High Intensity Interval Training (HIIT) generally refers to repeated sessions of relatively brief intermittent exercise often performed with "all-out" exertion or at a loudness close to that which elicits Vo_2 . The point of the study was to find if high-intensity interval training would get an effect on the neuroticism of physical education students. A representative sample of 40 males and 40 females was randomly selected from physical education department of Swami Vivekananda Subharti University, Meerut, and Uttar Pradesh. The age range of subjects was between the ages of 20 and 25, and they were splinted into two groups, randomly an EG experimental group and CG control group (CG). Experimental group underwent high - intensity intermittent training for twelve weeks. Pre and post test data of neuroticism were collected and three - way ANCOVA applied, further simple effect was seen to study the significance between control and experimental group. The test was significant at $p < 0.05$. Result: The study found the training outcome insignificant in both genders of urban students. All of the urban area and rural area students were found to be higher than each other. Conclusion: The study concluded that HIIT training was not effective on neuroticism. dia.

Keywords: HIIT, Neuroticism, High Intensity Interval Training.

Introduction

High Intensity Interval Training is a method of coordinating aerobic respiratory training in which active intervals of high intensity are accompanied by non-active recovery periods of low intensity. From a scale of 1 to 10, the intensity is something above a level of 7. When using maximum heart rate (MHR) as the reference, vigorous exercise can be considered to reach 80 percent of MHR. The different forms of High-Intensity Interval Training include outdoor activities such as running, swimming, elliptical running, stair-climbers, or stationary bikes. Interval training calls for demanding work-rates such as sprints lasting up to two minutes on treadmills, bikes or running. An intense workout will start with a warm-up of 5-10 minutes that gradually increases from a 3 RPE to a 5 RPE. If your body begins to warm up, you can then begin the intervals. For High Intensity Interval Training, there should be approximately 1 minute of work to every 3 minutes of active recovery. Participating in a routine exercise program during the recovery period will accelerate the elimination of metabolic waste and improve energy efficiency for higher intensity training. Start with less work intervals and work them up to do more intensive work. Sports Psychology is the study of the psychological issues involved in sport

performance and how playing sports can affect one's cognitive skills and physical capabilities. While the psychology of sports is highly applicable outside of the sport, motivation, social dynamics, and anxiety are all vital aspects of sports. The effect of sports psychology is infinite. The HIIT training given for 12 weeks, result of the study indicates a significant difference in Pre- Post training data of neuroticism at earlier stage but when we analyses the simple effect it did not show any significant difference in participants. In this particular study, HIIT was used as a method of intense fitness. It was intense, and the intensity of the exercise was the focus. The main goal of the research was to investigate the impact of high-intensity exercise on physical education students' neuroticism.

Material and Method

A total of 40 male and 40 female students were randomly selected from Swami Vivekananda Subharti University, and Uttar Pradesh. As the subjects were from 20 to 25 years of age, the respondents participated to the study after being granted prior consent. The pre and post test control group configuration was introduced. All topics were grouped together in two classes. Control group, an experimental group, and both the gender of those

participating in the research. The experimental group underwent high intensity interval training for duration of 12 weeks while the control group did not undergo same training. Among the examined population, the neuroticism was calculated before and after the 12 weeks of training.

Variable Neuroticism

Neuroticism was measured by big – five inventory questionnaire. The participants were given the questionnaire after explaining them how to response it and proper instructions.

Statistical Analysis

The descriptive statistical analysis of collected data was calculated and values of selected variables were shown as mean \pm SD. The three – way ANCOVA was used to find out the significance difference between pre and post test data of all groups. Further simple main effect was seen to find out the effect of one variable or set of variables across the levels of another variable. The significant level was set at $p < 0.05$ for all cases.

Neuroticism Table 1

Descriptive Statistics for the data on Neuroticism in different groups during treatment

Groups	Gender	Geo conditions	Mean	Std. Deviation	N
Experimental	Male	Urban	23.30	2.05	10
		Rural	19.90	2.84	10
		Total	21.60	2.98	20
	Female	Urban	24.20	2.52	10
		Rural	25.90	4.22	10
		Total	25.05	3.50	20
	Total	Urban	23.75	2.29	20
		Rural	22.90	4.66	20
		Total	23.32	3.65	40
Control	Male	Urban	20.20	1.31	10
		Rural	20.60	3.47	10
		Total	20.40	2.56	20
	Female	Urban	19.50	3.50	10
		Rural	18.60	2.41	10
		Total	19.05	2.96	20
	Total	Urban	19.85	2.60	20
		Rural	19.60	3.08	20
		Total	19.72	2.81	40
Total	Male	Urban	21.75	2.31	20
		Rural	20.25	3.10	20
		Total	21.00	2.81	40
	Female	Urban	21.85	3.82	20
		Rural	22.25	5.02	20
		Total	22.05	4.41	40
	Total	Urban	21.80	3.12	40
		Rural	21.25	4.24	40
		Total	21.52	3.71	80

Table 3
Three-way ANCOVA table for the data on Neuroticism in different groups during treatment

Source	Type III Sum of Squares	df	Mean Square	F	p-value
Pre_Neuroticism	485.884	1	485.884	264.319	.000
Groups	9.193	1	9.193	5.001	.028*
Gender	.489	1	.489	.266	.608
Geo_Condition	.562	1	.562	.306	.582
Groups * Gender	13.283	1	13.283	7.226	.009*
Groups * Geo_condition	3.649	1	3.649	1.985	.163
Gender * Geo_condition	.067	1	.067	.036	.849
Groups * Gender * Geo_Condition	6.078	1	6.078	3.307	.073
Error	130.516	71	1.838		
Total	38156.000	80			
Corrected Total	1089.950	79			

Table3 shows that the F-value for Pre Neuroticism (covariate) is significant because p value 0.000 is less than 0.05. It shows that the initial conditions of the experimental groups are not same, and that is why we are applying three – way ANCOVA after adjusting mean values of the dependent variable for the covariate.

The F-value for comparing the adjusted means of the Neuroticism in groups (experimental and control group). The F-statistic computed for high intensity workout is insignificant because p -value associated with it is .028 which is lesser than 0.05. Thus, the null hypothesis of no difference among the adjusted means for the data on Neuroticism in treatment groups may be rejected at 5% level.

The F-value for comparing the adjusted means of the Neuroticism in gender (Male and Female).The F-statistic computed for high intensity workout is insignificant because p -value associated with it is .608, which is, more than 0.05. Thus, the null hypothesis of no difference among the adjusted means for the data on Neuroticism in gender may not be rejected at 5% level.

The F-value for comparing the adjusted means of the Neuroticism in geo conditions (Urban and Rural). The F-statistic computed for high intensity workout is insignificant because p -value associated with it is .582, which is more than 0.05. Thus, the null hypothesis of no difference among the adjusted means for the

data on Neuroticism in geo conditions may not be rejected at 5% level.

The F-value for comparing the adjusted means of the Neuroticism in interaction (groups x gender).The F-statistic computed for high intensity workout is insignificant because p -value associated with it is .009, which is less than 0.05. Thus, the null hypothesis of no difference among the adjusted means for the data on Neuroticism in interaction (groups x gender) may be rejected at 5% level.

The F-value for comparing the adjusted means of the Neuroticism in interaction (groups x geo condition).The F-statistic computed for high intensity workout is insignificant because p -value associated with it is .163, which is more than 0.05. Thus, the null hypothesis of no difference among the adjusted means for the data on Neuroticism in interaction (groups' x geo conditions) may not be rejected at 5% level.

The F-value for comparing the adjusted means of the Neuroticism in interaction (gender x geo condition).The F-statistic computed for high intensity workout is insignificant because p -value associated with it is .849 which is greater than 0.05. Thus, the null hypothesis of no difference among the adjusted means for the data on Neuroticism in interaction (gender x geo conditions) may not be rejected at 5% level.

The F-value for comparing the adjusted means of the neuroticism in interaction (groups x gender x geo conditions).The F-statistic

computed for high intensity workout is insignificant because p -value associated with it is .073 which is greater than 0.05. Thus, the null hypothesis of no difference among the adjusted means for the data on Neuroticism in interaction (groups x gender x geo conditions) may not be rejected at 5% level.

In a three-way ANCOVA, the mean values of the groups of the three independent variables have been adjusted by the covariate, pre-test (i.e., they are adjusted means). This is important because the statistical significance of the three independent variables (i.e., whether the group means are statistically significantly different) is based on the adjusted means

and not the unadjusted means. If we ignore these adjusted means, it would be as though the three-way ANCOVA was never run. Therefore, the estimates table presents the adjusted mean, standard error and 95% confidence interval of the adjusted mean for the dependent variable neuroticism, for each combination of groups of the three independent variables: gender(i.e. Male and Female groups), geographical conditions (i.e. Urban and Rural) and groups (i.e. experimental and control groups).

Table 4
Estimates table for groups on post data of Neuroticism

Groups	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Experimental	21.916 ^a	.231	21.454	22.377
Control	21.134 ^a	.231	20.673	21.596

Covariates appearing in the model are evaluated at the following values: pre Neuroticism = 21.1375.

Table 5
Estimates table for gender on post data of Neuroticism

Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Male	21.446 ^a	.216	21.015	21.877
Female	21.604 ^a	.216	21.173	22.035

a. Covariates appearing in the model are evaluated at the following values: pre Neuroticism = 21.1375.

Table 6
Estimates table for geo condition on post data of Neuroticism

Geo - conditions	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Urban	21.609 ^a	.215	21.181	22.037
Rural	21.441 ^a	.215	21.013	21.869

a. Covariates appearing in the model are evaluated at the following values: pre Neuroticism = 21.1375.

Table 7
Estimates table for group * gender on post data of Neuroticism

Groups	Gender	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Experimental	Male	21.409 ^a	.303	20.804	22.014
	Female	22.422 ^a	.344	21.737	23.107
Control	Male	21.482 ^a	.310	20.863	22.101
	Female	20.787 ^a	.321	20.146	21.428

Table 8
Estimates table for group * geo condition on post data of Neuroticism

Groups	Geo conditions	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Experimental	Urban	22.213 ^a	.318	21.580	22.846
	Rural	21.618 ^a	.313	20.993	22.242
Control	Urban	21.005 ^a	.311	20.384	21.626
	Rural	21.264 ^a	.320	20.626	21.902

Table 9
Estimates table for gender * geo condition on post data of Neuroticism

Gender	Geo conditions	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Male	Urban	21.559 ^a	.303	20.954	22.164
	Rural	21.332 ^a	.310	20.713	21.951
Female	Urban	21.659 ^a	.303	21.054	22.264
	Rural	21.550 ^a	.306	20.939	22.160

Table 10
Estimates table for group *gender * geo condition on post data of Neuroticism

Groups	Gender	Geo conditions	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
Experimental	Male	Urban	22.018 ^a	.436	21.149	22.887
		Rural	20.800 ^a	.432	19.938	21.662
	Female	Urban	22.409 ^a	.443	21.526	23.291
		Rural	22.435 ^a	.479	21.481	23.390
Control	Male	Urban	21.100 ^a	.432	20.238	21.962
		Rural	21.864 ^a	.436	20.995	22.733
	Female	Urban	20.909 ^a	.437	20.037	21.782
		Rural	20.664 ^a	.447	19.773	21.556

In three-way ANCOVA there are three independent factors i.e. groups and group gender whose effect need to be investigated. In this study interaction effect is significant in (groups x gender) and (gender x geo conditions), hence analyzing main effect

become meaningless. Therefore, we will analyze simple effect of interactions.

Interaction effect (Groups X Gender)

Simple effect of group: To find the simple effect of groups we shall compare the Neuroticism scores of both groups in each gender category.

Table 11
ANCOVA table for the data on Neuroticism in experimental group on geo- condition

Source	Type III Sum of Squares	df	Mean Square	F	p-value
Pre_neuro	226.830	1	226.830	125.696	.000
Geo_condition	.054	1	.054	.030	.864
Error	66.770	37	1.805		
Total	17948.000	40			
Corrected Total	308.000	39			

The F-value for comparing the adjusted means of the neuroticism in experimental group on geo-condition. The F-statistic computed for high intensity workout is insignificant because p -value associated with it is 0.864 which is

more than 0.05. Thus, the null hypothesis of no difference among the adjusted means for the data on neuroticism in experimental group on gender may not be rejected at 5% level.

Table 12
ANCOVA table for the data on Neuroticism in control group on geo- condition

Source	Type III Sum of Squares	df	Mean Square	F	p-value
Pre_neuro	338.793	1	338.793	205.137	.000
Geo_condition	3.259	1	3.259	1.974	.168
Error	61.107	37	1.652		
Total	20208.000	40			
Corrected Total	759.900	39			

The F-value for comparing the adjusted means of the neuroticism in experimental group on geo-condition. The F-statistic computed for high intensity workout is insignificant because p -value associated with it is 0.168 which is

more than 0.05. Thus, the null hypothesis of no difference among the adjusted means for the data on neuroticism in control group on geo-condition may not be rejected at 5% level.

Table 13
ANCOVA table for the data on Neuroticism in control group on urban

Source	Type III Sum of Squares	df	Mean Square	F	p-value
Pre_neuro	333.286	1	333.286	180.118	.000
Groups	5.561	1	5.561	3.006	.091
Error	68.464	37	1.850		
Total	22283.000	40			
Corrected Total	520.775	39			

The F-value for comparing the adjusted means of the neuroticism in control group on geo-condition (Urban). The F-statistic computed for high intensity workout is insignificant because p -value associated with it is 0.091 which is

more than 0.05. Thus, the null hypothesis of no difference among the adjusted means for the data on neuroticism in control group on geo-condition may not be rejected at 5% level.

Table 14
ANCOVA table for the data on Neuroticism in control group on Rural

Source	Type III Sum of Squares	df	Mean Square	F	p-value
Pre_neuro	221.265	1	221.265	116.150	.000
Groups	5.120	1	5.120	2.688	.110
Error	70.485	37	1.905		
Total	15873.000	40			
Corrected Total	309.975	39			

The F-value for comparing the adjusted means of the neuroticism in control group on geo-condition (Rural). The F-statistic computed for high intensity workout is insignificant because

p -value associated with it is 0.110 which is more than 0.05. Thus, the null hypothesis of no difference among the adjusted means for the

data on neuroticism in control group on geo-condition may not be rejected at 5% level.

Discussion

This research attempts to describe the psycho-physiological effect of high-intensity interval training and examine neuroticism. Previous researches were only looking at the time periods over which exercise has beneficial results, to the best of our understanding. **Tsutsumi, T. et al. (1998)** The study was designed to examine the psychological benefits of anaerobic exercise for older adults. As for psychological changes, both training groups significantly improved positive mood (vigor), and the moderate intensity group significantly reduced trait anxiety compared to means of the control group. But not on high intensity, with high intensity result were not similar, subjects were found more irritating. Similarly, **Aylett, E., Small, N., & Bower, P. (2018)**. Carried out a study which revealed that the participants found the training schedule too strenuous. Given the finding that high intensity regimens are more effective than low intensity regimens. **Milanovic et.al, (2015), Gist et.al, (2014), Weston et.al, (2014)** results are in accordance with a recent meta-analysis of relatively healthy young adults noting that HIIT-based treatments did not substantially enhance cardiorespiratory fitness efficiency as opposed to MICT protocol. Randomization, as is well known, aims to balance and account for known and unknown factors that might affect the dependent variables; even so, it can not sufficiently objective the identification of these

factors, particularly while sample sizes are small. Therefore, if there are variations in any of the variables between groups, as in this case, they should be adjusted in the final analysis, which endorses the use of a three-way ANCOVA in our diastolic blood pressure and conscientiousness analysis. A study carried out by **Binboğa, et.al, (2013)**, Participants completed questions relating to conscientiousness from the Five-Factor Personality Inventory and were divided into groups of high and low conscientiousness according to a median split. There were 30 female and 53 male elite athletes on the sample. The study was partitioned by scores of conscientiousness; verbal encouragement resulted in a substantial increase in MVC in the low-conscientiousness group, while verbal encouragement resulted in a non-significant decrease in MVC in the high-conscientiousness group. The percentage shift in MVC through experimental conditions was substantially different between classes, with an increase of 9.72 percent during the low-conscientiousness group's verbal encouragement and a decrease of 2.47 percent during the high-conscientiousness group's verbal encouragement.

Conclusion

The result of the study concluded that the neuroticism was significantly improved, at initial stage of analysis but when we went for simple effect analysis it did not show any significant change among the physical education students after applied twelve weeks HIIT training.

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