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A Study on Comparison of Short-Term CrossFit Training and High Intensity Interval Training on Mood States in Collegiate Athletes

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Abstract

This study was aimed to compare the short-term effects of CrossFit training and high intensity interval training on mood states in collegiate athletes **Method:** Fifty-four collegiate athletes were selected based on inclusion and exclusion criteria. They were randomly allocated into CrossFit and HIIT. Their mood state was assessed before training on first day and after four weeks of training using profile of mood state questionnaire. **Results**: 't' is significant in both the groups. TMD (total mood disturbance) Post scores is higher in group-B compared to that of group-A. **Conclusion**: CrossFit training is found to be effective in reducing negative mood than High Intensity Interval training.

Keywords: Cross Fit, HIIT, POMS, collegiate athlete, total mood disturbance

Introduction

Modern day college students undergo immense pressure to achieve academic performance due to heavy competition. In addition to this, adjusting to life away from home, social demands and financial challenges are few other burdens that college students have to confront in modern days. Not only this, but the normal stress associated with college life also increases a collegiate-athlete's risk of experiencing physical as well as mental issues[1].Normal stress associated with college life also increases a collegiate-athlete's risk of experiencing physical as well as mental issues[2].

The relationship between physical exercise and mood improvement has been proven in numerous studies[3].Physical exercise is recognized as an effective tool for self-regulation of well-being in normal populations. Engaging in strength training reduces negative mood, increases energy, and reduces tension[4]. Miller et al. (2005) showed that the feeling of satisfaction with the exercises acts as a mediator between the mood before exercise and the positive mood after training[5]. CrossFit training and High Intensity Interval Training (HIIT) are the strength and conditioning training methods that are gaining popularity in recent years[6].

CrossFit, also called as High intensity power training, is "constantly varied high intensity functional movement". CrossFit is a physically and metabolically demanding conditioning method which is used to optimize physical competence in ten fitness attributes: cardiovascular/respiratory endurance, stamina, strength, flexibility, power, speed, coordination, agility, balance, accuracy. It uses the name "workout of the day"(WOD) in varied time domains.[7,8,9] Some workouts are performed in the "as many rounds as possible"(AMRAP) style using varying time domains, ranging from 10 to 20 minutes. In these training sessions, high intensity exercises are executed quickly, repetitively, and with no recovery time between sets. It uses the main aspects of gymnastics, weight lifting exercises and cardiovascular activities[10,11].

HIIT involves repeated execution of high intensity exercise interspersed with recovery periods of low intensity exercise or complete rest[12].Numerous protocols can be framed by altering the intensity, duration and recovery period. Two categories of HIIT have emerged, one is aerobic HIIT and the other is body weight or resistance HIIT[13]. Aerobic HIIT most often uses running and cycling to deliver the desired intensities. Resistance HIIT uses the calisthenics, plyometric, and or loaded lifts in training[14]

Mood state assessment provides a reliable and easy way to measure individual responses to a training load.One of the effective measures of mood states in athletes is through the use of Profile of Mood State (POMS) questionnaire[15].Primary advantage of POMS is that it appears to be useful in detecting mood fluctuations associated with exercise[16]. This study was aimed to compare the short-term effect of CrossFit training and high intensity interval training on mood states in collegiate athletes.

Method

Fifty-four male collegiate athletes were selected based on convenient sampling method. The inclusion criteria were individuals with the age group 18 to 22 years[17], Body Mass Index ranges between 20 to25 kg/m^2, low risk category in physical activity readiness questionnaire[18] (PAR-Q), positive prone transverse abdominis activation test[19], normal ECG report. Body builders and those with Musculoskeletal injuries, Cardio respiratory conditions, systemic illness was excluded. This study was approved by institutional ethical committee. Written informed consent were obtained from the participants priorly. Then they were randomly allocated into group A (n=27) and group B (n=27). Pre-test was done before training to assess the individual's mood state using profile of mood state questionnaire. Athletes were asked to fill the questionnaire about 'how they are feeling right now'. The group A participants were trained on CrossFit and group B were trained on High intensity interval training (HIIT) for four weeks. Post-test was done on the last day of training. Total duration of the study was six weeks.

Intervention

***CrossFit*:**

The workouts were designed by certified CrossFit trainer based on the guidelines given in the CrossFit website. Warm up and cool down time 5 minutes were given to the participants. The athletes followed the below workout of the day(WOD) schedule on every Monday, Wednesday and Friday for four weeks. Their heartrate was continuously monitored using chest strap heart rate monitor. Total duration of the workout were 30 minutes.

	Monday	Wednesday	Friday
Week 1	Run 2k	5 rounds -Box jump 5 -Medicine ball clean 5	20 min AMRAP -rowing 200m -Push up 10 -wall ball 10
Week 2	5 sets -Push up 10	3 rounds -medicine ball slam x 10 -jump rope x 50	20 min AMRAP -Box jump x 5 -Kettle bell swing x 5 - run 200m
Week 3	5 sets -Dumbbell deadlift x 10	3 rounds -rowing 500m -burpees x10	20 min AMRAP - Air Squat x 5 - Run 500m - Medicine ball slam x 5
Week 4	3 sets -Rowing 500m	3 rounds -tuck jump x 15 -medicine ball clean x 15	20 min AMRAP - Run 500m - Push-up x 10 - Medicine ball clean x 5

HIIT Protocol

As HIIT is defined as short burst of high intensity exercise followed by low intensity exercise or complete rest, the athletes were trained on 1:1 work to recover ratio with the training intensity of 80 to 90 % of heart rate max and recovery intensity of 40 to 50% of heart rate max[20,21,22]. Thereby duration of 3 minutes of high intensity and 3 minutes of low intensity were followed. The exercise intensity for the athletes were calculated using Karvonen formula[23]. They were instructed to do warm up and cool down for 5 minutes each. The exercises included were running, rowing, dumbbell deadlift, cycle ergometer, kettlebell swing. Total duration of the workout was 30 minutes.

Outcome Tool

Profile of mood state questionnaire (POMS)[24,25]

The athlete's mood states were assessed using POMS which was originally created by Mc Nair et al in 1971. POMS contains 65 adjectives with six subscales rated on a 5-point scale meant to measure Tension-Anxiety(TEN), Depression-Dejection(DEP), Anger-Hostility(ANG), Vigour-Activity(VIG), Fatigue-Inertia(FAT), and Confusion-Bewilderment(CON).The athletes were asked to fill the questionnaire about 'how they are feeling right now'.

Total Mood Disturbance (TMD) was calculated by adding the totals of the negative subscales and then subtracting the totals of the positive subscales: TMD=[TEN+DEP+ANG+FAT+CON] – VIG. A constant of 100 was added to the TMD formula to eliminate negative scores.

Data Analysis and Results

Table 1: Total Mood Disturbances in Crossfit Group

Paired Samples T-Test

Measure 1		Measure 2	t	df	p	Mean Difference	SE Difference	95% CI for Mean Difference	
								Lower	Upper
Group A Pre TMD	-	Group A Post TMD	8.995	26	< .001	7.667	0.852	5.915	9.419

Table 2: Total Mood Disturbances in HIIT Group

Paired Samples T-Test

Measure 1		Measure 2	t	df	p	Mean Difference	SE Difference	95% CI for Mean Difference	
								Lower	Upper
Group B Pre TMD	-	Group B Post TMD	2.116	26	0.044	2.111	0.998	0.060	4.162

Table3: pre and Post Values of Individual Subscales

POMS	Group A				Group B			
	Pre	Post	Difference %	P	Pre	Post	P	Difference %
Anger	10.037	7.962	20.7%	<0.001	10.259	8.778	0.003	14.4%
Confusion	7.111	5.704	19.8%	<0.001	6.63	6.185	0.011	6.7%
Depression	7.749	5.889	24.0%	<0.001	8.037	7.333	0.17	8.8%
Fatigue	7.111	8.037	-13.0%	0.001	9.222	10.67	<0.001	-15.7%
Tension	9.63	8.296	13.9%	<0.001	8.815	8.444	0.115	4.2%
Vigour	14.556	16.185	-11.2%	0.043	14.444	15.111	0.363	-4.6%

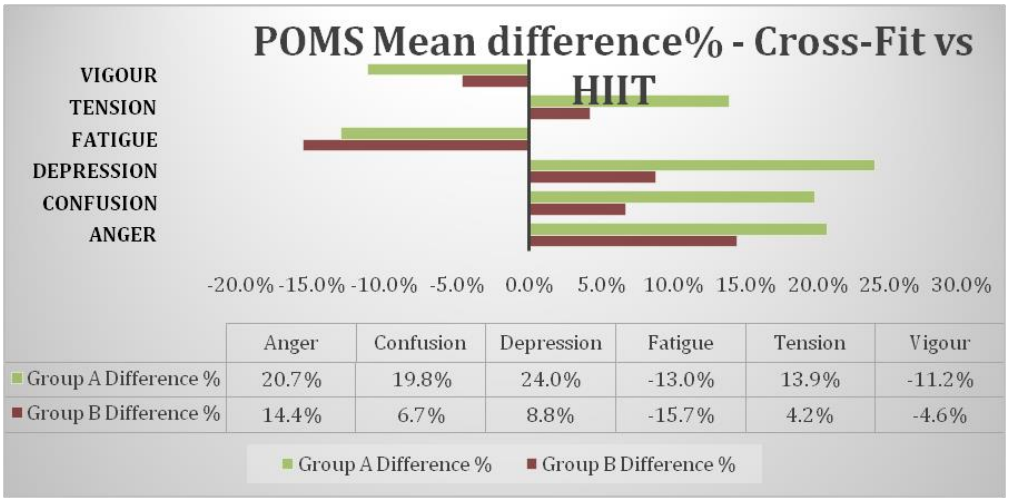

Fig: 1 post-Test values of Anger, Confusion, Depression and Tension are Increased in Group A. post Test values of Vigour and Fatigue are Decreased in Group A than Group B

Table 1 shows that there were significant changes in group A when comparing pre-test score of total mood disturbances(TMD) with the TMD post scores. Table 2 shows that there were significant changes in group B when comparing pre-test score of total mood disturbances(TMD) with the TMD post scores. Table 3 shows that there was significant reduction in individual mood scales; anger, confusion, Depression, and Tension in both groups. Vigour and fatigue increased in both the groups. Figure1 shows percentage increase in all the individual subscale was higher in group A than group B.

Discussion

This study was aimed to compare the short-term CrossFit training and High Intensity interval training (HIIT) on mood states in collegiate athletes. The Profile of Mood States (POMS) has been used greatly in the field of sports and exercise for the assessment of mood. In recent days, there is increase in popularity among CrossFit and HIIT. More number of studies were done on CrossFit workout and HIIT on assessing the mood state of various athletes. To the best of our knowledge this is the first interventional study to compare the effects of two training methodologies on mood state in collegiate athletes.

The results showed that Percentage increase in all the mood clusters was higher in group A than group B. Luliia Pavlova et al**,**2019 stated that 8-week CrossFit program was useful for increase in self-confidence and improving mood. In this study, though performed for a reduced term of 4 weeks, it has been found that athletes mood states were improved. In another study, Nicholas Drake et al 2017, stated that women reported more enjoyment and likelihood to continue CrossFit training compared to Resistance training and moderate intensity aerobic exercise. In this study, the male collegiate athletes studied also reported more enjoyment when doing CrossFit training than HIIT. Moreover, participants in group B experienced more fatigue than group A participants. This might be due to the repetition of same type of high intensity exercise unlike CrossFit group where the exercise is constantly varied. Alexandre Lopes Evangelista1 et al, 2017 stated that the HIIT body work training led to changes in mood levels and progressive reduction in affectivity. This statement correlates with our study. Fry AC et al 1997 in their

study stated that negative changes in psychological status are an early symptom of overtraining syndrome in athletes. This needs to be considered while giving training in HIIT workout. The limitation of this study is short training duration, only male collegiate athletes were studied and timing as administration of questionnaire in different time might lead to a different result. Long-term CF training may provide enough volume to produce positive effects, even in individuals with initial high relative levels of fitness, as there will be greater time spent to train each component of fitness (Nicholas Drake et al 2017).

Conclusion

CrossFit training is found to be effective in reducing negative moods than HIIT in male collegiate athletes. Incorporating regular CrossFit and HIIT protocols in their training regimen will help to minimize the mood disturbances created during competition which in turn enhances athletes' performance.

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