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Effect of meditation on mental fatigue of soccer players of Chandigarh

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Abstract

Mental fatigue causes individuals to perform less well than expected (Dantzer *et al.*, 2014). The purpose of the present research was to ascertain the effect of meditation training on mental fatigue amongst the soccer players of Chandigarh. It was hypothesized that there is no effect of meditation on mental fatigue of the soccer players. The sample of twenty male Soccer players was randomly selected from the population. The sample was further randomly divided into two groups i.e., an experimental groups and a control group. The experimental group was given training for six weeks in the evening session for 25 to 30 minutes for alternate days per week for the period of six weeks. Analysis of Covariance (ANCOVA) was used to compare the mean scores of pre and post group test in the present study. The results of the study were examined at 0.05 level of significant. The results of the study suggest that meditation training has significant effect on the mental fatigue of the soccer players of Chandigarh.

Keywords: mental fatigue, stress and meditation

Introduction

Competition in sports has become so demanding today that the athletes need to work very hard to achieve success. Athletes are required to meet two types of demands competition demands and training demands to achieve success. These two demands are interrelated and have negative impact on psychological aspect of athletes. Silva (1990) [23] Training stress is defined as having both positive and negative adaptation responses. Positive adaptations to training stress are desirable and generally demonstrate appropriate responses to physical and psychological overloads imposed to initiate a training effect. Negative adaptations to training stress generally occur when an imbalance exists between imposed training demands and coping capacities. Thus not all training stress leads to negative adaptation at psychological or physiological response levels. Negative training stress responses are hypothesized to regress along a continuum from staleness to overtraining to burnout. This regressive pattern is labelled the training stress syndrome. Clear definitions and distinctions for staleness, overtraining and burnout are presented along with the conceptual models for positive and negative adaptation to training stress. Marcora, Staiano & Manning (2009) [20] Mental fatigue is a psychobiological state caused by prolonged periods of demanding cognitive activity. Our study provides experimental evidence that mental fatigue limits exercise tolerance in humans through higher perception of effort rather than cardio respiratory and musculoenergetic mechanisms.

On the other hand, it may also deactivate facilitative brain centers (normally responsible for motivated behavior and increased drive toward a reward), also resulting in decreased drive. Mental fatigue is associated with a broad range of 'side-effects': lack of energy, increased fatigability and feelings of lassitude, decreased feelings of motivation and alertness and changes in perception and mood (Dantzer *et al.*, 2014) [17]. On the contrary, the 'strength of self-control theory' posits that ego-depleting tasks deplete a single global metaphorical strength that has limited capacity and hence impair subsequent performance (Baumeister *et al.*, 1998) [2]. Nevertheless, the hypothesis of the depletion of energy substrates (such as glucose) in the brain causing performance decrements has been refuted convincingly (Kurzban, 2010) [17]. Beedie and Lane (2012) [3] suggest convincingly that the effects of mentally fatiguing tasks should be considered in light of an individual's allocation of resources in response to the perceived importance of the task at hand (and its costs). We therefore propose to study the

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effects of mental fatigue by considering the interaction between perception of effort and motivation (Kurzban *et al.*, 2013; Pageaux, 2014) [18, 22]. Mental fatigue manifests primarily as reduced cognitive performance (Chaudhuri and Behan, 2004) [6], and is caused by prolonged periods of demanding cognitive activity (Boksem and Tops, 2008) [4]. Mentally fatiguing tasks, such as the ‘Stroop task,’ force subjects to inhibit their initial response before providing the right answer. They are perceived as effortful and fatiguing; and ultimately reduce cognitive efficiency and performance (Chaudhuri and Behan, 2004; Marcora *et al.*, 2009) [6, 20]. Task duration seems crucial, as short duration tasks (less than 30 min) have not been found to yield any negative effects on consequent exercise performance, but can impair cognitive performance (Hagger *et al.*, 2010; Graham *et al.*, 2014) [13, 12]. Mental fatigue causes individuals to perform less well than expected (Dantzer *et al.*, 2014) [7], even in exercise of long duration although cognitive functioning (such as reaction time or complex decision making) seems less crucial for a successful endurance performance (Elferink-Gemser and Hettinga, 2017; Marcora *et al.*, 2009; Van Cutsem *et al.*, 2017) [9, 20, 11].

Fadel, Johnson, suggest that 4 days of meditation training can enhance the ability to sustain attention; benefits that have previously been reported with long-term meditators. People who have undergone extensive meditation training have shown improvements on cognitive performance (Cahn & Polich, 2006) [5] and mood (Davidson *et al.*, 2003) [8]. Johansson, Bjuhr & Ronnback (2012) [1] implemented a novel, non-pharmacologist strategy aimed at improving the condition of patients suffering from mental fatigue after a stroke or traumatic brain injury. The result shows that Mindfulness Based Stress Reduction (MBSR) may be a promising non-pharmacological treatment for mental fatigue after a stroke or TBI. The present research is an attempt to ascertain the effect of meditation on mental fatigue. Based on the literature gone through the null hypothesis was formed that there is no effect of meditation on mental fatigue of the soccer players.

Methodology

The present study was an analytical research focused on the reduction in mental fatigue through meditation training. The research method used in the present research was an experimental method in which Quasi Experimental Design was used so that the appropriate trade of, between internal and external validity of the experiment, could be established.

Participants

The population for the study was the male Soccer players enrolled in Day Boarding Scheme (DBS) of Sports Authority of India from the Chandigarh region. The sample of twenty male Soccer players was randomly selected from the population. The sample was further randomly divided into two groups i.e., an experimental groups and a control group. Each group comprises of 10 soccer players. The age of the players varies from 19 to 21 years. Prior to the administration of tests the research scholar held a meeting with the subject. The objective and purpose of the study was made clear to the subject so that they got aware of what they were expected to do.

Tools

Mental Fatigue: The mental fatigue of the students was assessed by using Mental Fatigue Test (MBT-B) constructed by Dr. Vivek Bhargava.

Administration: The atmosphere of the experimental hall should be peaceful. It should be seen that the subjects continues to do the work in a uniform manner. It should also be seen that the subject has not come already tired at the start of the experiment.

Instruction: Please take out the multiplication Table and start multiplication one by one in the table. First of all, one have to multiple the first figure with the second one i.e., $8 \times 3 = 24$; then multiply 4 of 24 with the next figure which is five in the above table, i. e., $5 \times 4 = 20$. Then 0 [(1) accepted is 7] has to be multiplied with 7 that is $7 \times 1 = 7$, then 7 is to be multiplied with 9,i.e., $9 \times 7 = 63$, then 3 of 63 has to be multiplied with 4 $4 \times 3 = 12$, then 2 of 12 has to be multiplied with 8, i.e., $8 \times 2 = 16$. Then 6 of 16 is to be multiplied with 6 $6 \times 2 = 12$. Time given is for half an hour. When the researcher say ‘stop’, subject have to place a full stop (.) at the place; but subject has not to continue the multiplication work in the other columns. The subject is given a multiplication chart in which figures are written in a vertical form in the manner indicated above. We have given a multiplication chart as an example.

Table 1: Mental Fatigue Test Sheet (Multiplication Chart)

8	6	8	6	5	6	9	7	8	8
3	3	9	9	1	5	3	8	5	4
5	4	4	2	6	9	8	4	2	3
7	7	5	3	8	8	7	2	6	9
9	2	7	8	3	3	9	4	1	5
4	5	8	5	9	1	3	2	8	7
8	8	3	7	4	7	9	9	4	2
2	1	1	9	7	4	4	8	3	4
8	9	7	5	2	8	7	3	7	1

Experimental procedure

After giving the above instructions, the subject is given some simple exercises in multiplication for two minutes. Then the experimental is started after giving the necessary caution. The stop-watch is started. After every two minutes, the subjects are asked to place a full stop at the figure at which he happened to be. In this manner for full 30 minutes he does the multiplication. The subjects have to make 15 trials. When the trials are over, chart is collected from the subjects. Then it is calculated as to how many multiplications and errors he has done within two minutes.

Formula of coefficient of mental fatigue

$$FC = \frac{(T_1 + T_2 + T_3) - (T_{13} + T_{14} + T_{15})}{T_1 + T_2 + T_3} \times 100$$

Where

$T_1 + T_2 + T_3$ = First three trials of Multiplication Chart.
 $T_{13} + T_{14} + T_{15}$ = Last three trials of Multiplication Chart.

Treatment

The experimental group was given training for six weeks in the evening session for 25 to 30 minutes for alternate days per week. Initially, the training was given in an isolated room so that the male soccer players can learn to meditate, in order to keep them away from distraction so that they can easily meditate. Later, ones they develop the skill of meditation they were given meditation in open ground. The meditation training was scheduled after the completion of their training schedule, during the cooling down session. The subjects were first relaxed for 5 – 10 mins by concentrating on their

breathing and after that the meditation training use to be given. The post test was conducted after the completion of six weeks training on Mental Fatigue.

Table 2: Meditation training programme for Soccer Players

Training Programme		
Week I		
Days	Experimental Group	Control Group
Tuesday	Deep-Breathing (<i>Kumb Rohan</i>)	Play Game
Thursday	Deep-Breathing (<i>Kumb Rohan</i>)	Play Game
Saturday	Deep-Breathing (<i>Kumb Rohan</i>)	Play Game
Week II		
Days	Experimental Group	Control Group
Tuesday	Deep-Breathing (<i>Kumb Rohan</i>), Alom Velom	Play Game
Thursday	Deep-Breathing (<i>Kumb Rohan</i>), Alom Velom	Play Game
Saturday	Deep-Breathing (<i>Kumb Rohan</i>), Alom Velom	Play Game
Week III		
Days	Experimental Group	Control Group
Tuesday	Deep-Breathing (<i>Kumb Rohan</i>), Zen Meditation	Play Game
Thursday	Deep-Breathing (<i>Kumb Rohan</i>), Zen Meditation	Play Game
Saturday	Deep-Breathing (<i>Kumb Rohan</i>), Zen Meditation	Play Game
Week IV		
Days	Experimental Group	Control Group
Tuesday	Deep-Breathing (<i>Kumb Rohan</i>), Transcendental Meditation	Play Game
Thursday	Deep-Breathing (<i>Kumb Rohan</i>), Transcendental Meditation	Play Game
Saturday	Deep-Breathing (<i>Kumb Rohan</i>), Transcendental Meditation	Play Game
Week V		
Days	Experimental Group	Control Group
Tuesday	Deep-Breathing (<i>Kumb Rohan</i>), Kumb-Rochan	Play Game
Thursday	Deep-Breathing (<i>Kumb Rohan</i>), Kumb-Rochan	Play Game
Saturday	Deep-Breathing (<i>Kumb Rohan</i>), Kumb-Rochan	Play Game
Week VI		
Days	Experimental Group	Control Group
Tuesday	Deep-Breathing (<i>Kumb Rohan</i>), Dynamic-Meditation	Play Game
Thursday	Deep-Breathing (<i>Kumb Rohan</i>), Dynamic-Meditation	Play Game
Saturday	Deep-Breathing (<i>Kumb Rohan</i>), Dynamic-Meditation	No Mental Training

Control

The attempt has been made by the researcher to control all the factors which may directly or indirectly influence the results of the study, so that the threat to internal can be minimise and the effect of independent variable (meditation) can be observed on dependent variable (mental fatigue); therefore a true experimental design i.e., randomised two group pre-post design was used. To minimise the placebo effect the double blind method was used.

Statistical techniques

In order to examine the hypothesis of the study Mean, SD, SEM, and ANCOVA were used to compare the mean scores of pre and post group test in the present study. The results of the study were examined at 0.05 level of significant.

Results

Analysis of Co variance was used to analyse the data by considering pre-test scores as a covariate.

Table 3: GroupWise Mean and Standard Deviation of male soccer players on mental fatigue in Post Test

Group	N	Actual Post-test Mean values		Adjusted Post-test Mean values	
		Mean	SD	Mean	SE
Experimental Group	10	51.67	17.03	46.46	5.03
Control Group	10	28.57	23.90	33.78	5.03

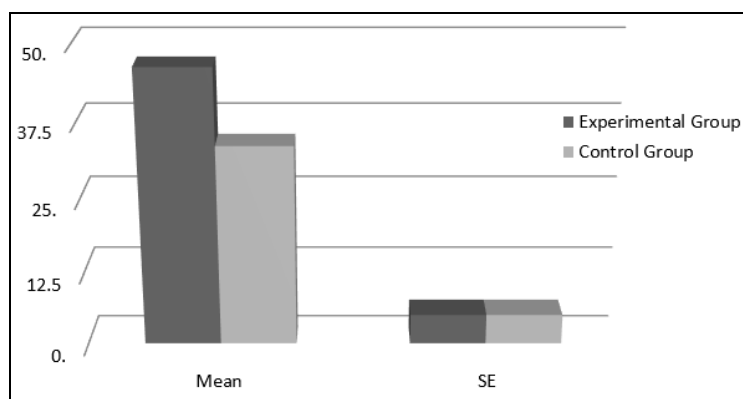


Fig 1: Mean Values of the experimental and control group during post-test on mental fatigue

The mean and the standard deviation of the experimental and control groups during post testing has been presented in the table 1, the mean scores of the male Football player from experimental group during the post test on mental fatigue is 51.67 and the standard deviation is 17.03, the mean score of male football player of control group at the post test on mental fatigue is 28.57 and the standard deviation is 23.90.

Further, the adjusted mean scores of the male soccer players of experimental group during the post test on mental fatigue is 46.46 with the standard error 5.03, The adjusted mean scores of the male soccer players of control group on mental fatigue during the post test is 33.78 with the standard error is 5.03, these values are different from that of the unadjusted values shown in table 1, this shows that the effect of covariant (Pre Test) is eliminated in comparing the effectiveness of the treatment in the post testing.

Table 4: ANOVA Summary of the two groups of male soccer players during post-test on mental fatigue

Source	Type I Sum of Squares	df	Mean Square	F
Intercept	342.18	1	342.18	1.44
Pre MFT	3734.90	1	3734.94	15.55
Group	701.40	1	701.40	2.967
Error	4019.41	17	236.43	
Total	42624.53	20		

Table no 3 shows that the f - value 2.967 after comparing the adjusted mean of all the two groups of male football players on mental fatigue during the post test. The f-value 2.967 is significant at 0.05 level of significance, with the degree of freedom (1, 17). It may therefore be said that the two groups differ significantly on mental fatigue during the post test.

Discussion

Mohan, Sharma, and Bijlani (2011) ^[21] Practice of meditation produced a relaxation response even in the young adult subjects who had never practiced meditation before. The practice of meditation reduced the physiologic stress responses without taking away the beneficial effect of stress, namely, improved memory scores. Thaddeus *et al.* (2009) ^[19] suggest that engagement in compassion meditation may reduce stress-induced immune and behavioral responses. Kaur and Thapa (2017) ^[15] found that the eight weeks of mantra meditation is useful in developing vigilance amongst the national level boxers. Kei, Masaaki, Kouzi, Osami, Hirohiko and Yasuyoshi (2011) ^[16] provide evidence that decreased parasympathetic activity and increased relative sympathetic activity are associated with mental fatigue induced by prolonged cognitive load in healthy adults. Further alterations of autonomic functions, such as decreased parasympathetic activity and increased relative sympathetic activity, have been reported in patients with CFS. Thereofre the reason for mental fatigue among the soccer players may be the decreased parasympathetic activity and increased relative sympathetic activity. However, Lang, Dehof, Meurer and Kaufmann (1979) ^[14] show that meditation enhances sympathetic activity. It is suggested that the “transcendental state” seems not to be a mere trophotropic parasympathetic functional state.

The analysis of the data suggest that the two groups i.e., experimental group (the group given meditation training) and the control group (the group do not receive meditation training) are significantly differ on their level of mental fatigue after the period of six weeks. The difference in the mean scores of the two groups is attributed to the independent

variable of the study (meditation) because the two groups are equal in all aspects such as their daily routine, diet, training schedule, training age, chronological age etc. The only difference between the two groups was the training which was given to experimental group. It may therefore be said that the meditation if done on alternated days for six weeks for 25 – 30 minutes can increase the ability of the players to delay their mental fatigue. The null hypothesis of the study that there is no effect of meditation on reducing mental fatigue amongst the male soccer players is rejected and the training found to be effective in reducing mental fatigue of the national level of soccer players.

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