



INTERRELATIONSHIP OF STRESS, BODY IMAGE, NEGATIVE MOOD STATE AND SUSCEPTIBILITY TO ABNORMAL EATING BEHAVIOUR AMONG GAME SPECIFIC FEMALE ATHLETES: AN EXPLORATORY APPROACH

**Madhurima Roy,
Subhra Chatterjee,
Swapan Kr Deyⁱ**

Human performance laboratory,
Sports Authority of India,
India

Abstract:

Purpose: To achieve and maintain a perfect body shape athlete often follows restrictive dieting which ultimately leads them to eating disorders. The purpose of the study was to identify whether there is an interrelationship of abnormal eating behaviours, perceived stress, negative mood state and self-perception of body image among athletic population and another was to observe the consequences of negative psychological well-being and game specificity on food choices and frequency. A secondary purpose of this study was to identify the “at risk-eating disorder” participants who were involved in different sports category. **Methods:** One thirty eight healthy young female participants matched for BMI were selected by purposive sampling. Subjects were divided into 4 categories i.e. aesthetic games group, endurance groups, strength group and healthy controls. Structured questionnaires were used for data collection during their non-competitive session. ANOVA followed by Scheffe’s test was applied to compare different parameters among the groups. Regression model examined the associations among disordered eating behaviours, stress, body shape concern, emotional eating, total mood disturbance and food choice. **Findings:** Result revealed disordered eating behaviour was significantly prominent in control and aesthetic game group than other two groups. Control group obtained the highest score in stress and emotional eating while aesthetic game group secured the highest score in body shape concern. Mood disturbance was more prevalent in strength group. Body mass index, body shape concern, emotional eating and total mood disturbance were identified as strongest predictor of EAT-26 scores. The result revealed that controls and aesthetic game group exhibit more abnormal eating behaviours than others. **Value:** This result will help to indicate abnormal eating behaviour and its relation with psychological

ⁱ Correspondence: email drskdey.sai@gmail.com

well-being among female athletic population. Interventions programmes should be designed to cope up with competitive pressure to avoid abnormal eating behaviour.

Keywords: abnormal eating behaviour; fast food; stress; body shape concern; female athletes; different sports

1. Introduction

Eating disorders can be described as serious illnesses that cause severe disturbances to a person's eating behaviours. It refers to a wide range of abnormal eating behaviours such as excessive or insufficient food intake, obsessions with food, body weight and shape. (NIMH, Eating Disorders) Depending on the severity and duration of the eating disorders illness, they may exhibit various kinds of physical symptoms like weight loss, amenorrhea, low blood pressure, depressed body temperature, chronic and unexplained vomiting and the growth of soft, fine hair on the body and face. Prolong untreated eating disorders ultimately lead to malnutrition. Eating disorder is a well-known health problem among female athletes than their male counterpart (Ramesh, 2014; Martinsen and Sundgot-Borgen, 2013). Elite athletes are too often experience competitive stressors and anxiety which leads them to a negative emotional state (Eysenck et al., 2007). Research found that weight category sports like endurance, aesthetic and strength game participants are more likely to develop abnormal eating habits to achieving and maintaining the desired body shape for those particular sports. (Torstveit et al., 2008) To get their desired thinness they usually adopt risky behaviours, such as restrictive eating, fasting, frequent skipping meals, diet pills, laxatives, diuretics, enemas, and purging, these behaviours also including bulimia, anorexia, overeating and binge eating. (Sundgot-Borgen and Torstveit, 2010; Milligan and Pritchard, 2006; Martinsen, 2010.)

Eating disorders are complex conditions which associated with several adverse physical, social, emotional and interpersonal factors. (NEDA, 2012) Abnormal eating behaviours are frequently appear with other illness like depression, stress, anxiety disorder and substance use. (Definition of Stress, 2010; National institute of mental health, 2014) Stress is not only a psychological illness but also related with poor health status by changing eating patterns and nutritional intake. Previous research shows that stressed individuals have higher tendency to consume food or snacks with high calorie and high fat (Rao et al., 2008; Unusan et al., 2006; Zellner et al., 2006) which may results in weight gain and obesity (Laitinen et al., 2002). Scientists also concurred that body image distortion and dissatisfaction play a crucial role in the development of eating disorders. (Henriques et al., 1996; Ackard et al., 2002) However, its relation with different sports is still unrevealed. Like body shape concern, state of mood is also associated with eating behaviours. Negative mood like depression, anxiety, tension may alter the eating habits and which ultimately leads to malnutrition. (Bartoszek et al., 2015).

There are limited data on susceptibility eating disorders and its relation with other psychological factors like stress, negative mood state, body image dissatisfaction etc. In India, most of the recorded data is about prevalence of eating disorders among athletes (Singh et al., 2015; Kumar et al., 2016) though the influence of game specificity on it is still hazy. Moreover, the relation of abnormal eating habits with stress, mood state and food choice is not explored much. The present study is undertaken to partially address this lacuna. The primary objective of the present study was to identify whether there is an interrelationship of abnormal eating behaviours, perceived stress, negative mood state and self-perception of body image among athletic population and another was to observe the consequences of negative psychological well-being and game specificity on food choices and frequency. A secondary purpose of this study was to identify the “at risk-eating disorder” participants who were involved in different sports category.

2. Material & methods

Study participants: This cross sectional study was conducted at Sports Authority of India from September’18 to November’18. Calculated sample size (by using G*Power software) was 112 and after considering the 25% drop out rate, 140 healthy young female participant aged between 18 to 21 years matched for BMI were selected by purposive sampling but two subjects left at the initial stage of this study. Finally, 138 participants were divided into four categories i.e. aesthetic game group (rhythmic and artistic gymnast), endurance group (long and middle distance runners, and walkers), strength group (sprint, jump, and throw) and healthy controls group. Athletes were divided in different groups according to their training patterns. Athletes who engaged in different sports but were getting almost similar training (except skill training) clubbed in to a specific group. The players of the present study were at least of state level performer with minimum of 3-4 yrs of formal training history. The training programme was applied on the present athletes consisted of aerobic and anaerobic training, scrimmaging, and different resistance training along with flexibility exercises according to their games. The average duration of training was 4 – 5 hours a day in both morning and evening session. Players were also undergone through the mental training sessions besides of their physical and technical training programme. The survey was made during pre-competition phase. Forty eight healthy and physically fit females were also selected as controls from the same locality. The decimal age of all the subjects were calculated from their date of birth certificate produced at the time of testing. Participant signed an informed consent form before the interview and testing procedure and this present study was approved by institutional ethical committee. The participants were also asked to respond honestly to all of the items of the questionnaires. The participants who were medically fit, healthy and with no history of any hereditary and cardio respiratory diseases, were included in this present study.

Anthropometric measurement: Height and weight of all the participants were measured by anthropometric rod and digital weighing machine respectively and Body Mass Index (BMI) was calculated ($\text{kg}\cdot\text{m}^{-2}$) at the Human performance laboratory of SAI, Kolkata.

Assessment of psychological parameters and lifestyle: A self-administered questionnaire was used to collect information regarding their injury occurrence, training regimen, years of athletic involvement and dietary pattern including frequency of meal consumption, snacking, food frequency, eating out habits, supplements intake etc.

Cohen's Perceived Stress scale: Cohen's Perceived Stress scale was used to measure stress. This scale assesses stress experienced over the past one month. Each item is rated on a 5-point scale ranging from 0 (never) to 4 (almost always) (Cohen et al., 1983).

Eating Attitude Test (EAT-26): Eating Attitude Test (EAT-26) (Garner and Garfinkel, 1979) was used to determine the risk of eating disorders. It has three subscales including dieting, bulimia and food preoccupation and oral control. According to this test individuals who scores 20 or more, may have some eating disorders and The Emotional Eating Questionnaire by Garaulet (Garaulet et al., 2012) was used to assess emotional eating in participants.

Emotional eating questionnaire (EEQ): EEQ comprised of 10 questions and each question has 4 options. EEQ test classified subjects in four groups, Score between 0-5, 6-10, 11-20, 21-30 is classified as non-emotional eater, low emotional eater, emotional eater and very emotional eater respectively. (Garaulet et al., 2012)

Body shape questionnaire (BSQ): The BSQ is a self-report measure of the body shape preoccupations typical of bulimia nervosa and anorexia nervosa. It was first reported by Cooper et al., 1986. In this study, we used the short version of BSQ which comprises 16 items. Each item rated on a 6- point likert scale. High score indicates (>66) marked concern with shape whereas low score specify (<38) no concern.

Profile of Mood States (POMS): The POMS questionnaire is a standard validated psychological test used in research to evaluate mood state. The first Profile of Mood States was developed by M. McNair et al., 1971. Several version of this questionnaire are available but for this study POMS was used. POMS consist of 65 adjectives rated on 5-point scale (0= not at all; 1=a little; 2=moderately; 3=quite a bit; 4=extreme). POMS is divided into 6 subscales including tension-anxiety (9 items, score range: 0-36), depression (15 items, range 0-60), anger-hostility (12 items, range 0-48), vigour-activity (8 items, range 0-32), fatigue (7 items, range 0-28), confusion-bewilderment (7 items, range 0-28). To complete the POMS, participants were asked to rate 'How you have been feeling during the past week, including today' on the basis of scales.

Assessment of Food Intake (FFQ): Athletes self-reported their food intake habits in a FFQ that measured their usual consumption of 12 food groups (each food group individually) (6 = "several times a day", 5 = "daily", 4 = "3 times a week", 2 = "once in a week", and 1 = "rarely" 0= "never").

2.1 Statistical analysis

Data was analyzed using the Statistical Program for the Social Sciences (SPSS) version 16.0 for Windows (SPSS Inc., Chicago, IL, USA). All values expressed as means \pm standard deviation (SD). A confidence level at 95% ($p < 0.05$) was considered as significant. One way ANOVA followed by Scheffe's Post Hoc was used to quantify the mean difference among all the groups. The Pearson correlation coefficient was used for testing correlations among the Eat score, perceived stress, body shape concern components, and mood states for each group. Multiple regression analyses were applied to examine how body shape concern components, emotional eating, perceived stress, body mass index, fast food eating and mood contributed to variance in EAT score and stress score.

3. Results

3.1 Anthropometric profile

Comparison of mean, SD and level of significance of physical characteristics of four different groups were shown in Table 1. Average BMI of aesthetic game groups, endurance, strength and control group was 20.5 ± 1.40 , 20.3 ± 2.72 , 21.1 ± 3.71 , 21.1 ± 3.71 , 21.1 ± 1.79 kgm^{-2} respectively. According to BMI classification 21% of the subject was accounted for underweight group, the normal weight group was 63%, the overweight group was 12% and the pre obese and obese group was 4% of all subjects.

Table 1: Comparison of mean, SD and level of significance of physical characteristics of different sports and control groups

Parameters	Aesthetic game (n=28)	Endurance (n=30)	Strength (n=32)	Control (n=48)
Age (years)	16.9 \pm 2.60	17.4 \pm 2.59	17.2 \pm 1.86	16.9 \pm 2.61
Height (m)	1.5 \pm 0.04	1.6 \pm 0.05	1.6 \pm 0.07	1.6 \pm 0.05
Weight (kg)	47.5 \pm 3.47	52.3 \pm 9.77	54.8 \pm 10.85	53.6 \pm 5.87
BMI (kgm^{-2})	20.5 \pm 1.40	20.3 \pm 2.72	21.1 \pm 3.71	21.1 \pm 1.79

Underweight = 21% (n=29); Normal= 62% (n=84); overweight=13% (n=17); Pre obese and obese= 4% (n=6)

* $p < 0.05$; ** $p < 0.01$

3.2 Assessment of eating behaviours, mood, body shape concern and perceived stress

Comparison of mean, SD and level of significance of EAT-26, TMD, EEQ, Stress and Body shape concern of different sports and control groups were listed in table 2. The table revealed that EAT scores significantly differed when compared among the group and also between control and strength group, aesthetic game group and endurance group, strength and aesthetic game group and endurance and strength group respectively. The average EAT score was higher in control and aesthetic game group than other two groups. Result also indicated that risk group (scores ≥ 20) accounted for 36.2% of total subject and 63.8% were under no risk group (scores < 20). Strength group scored highest point in Total mood disturbance (14.4 ± 4.53) and lowest score was in

control group (8.9±5.79). The difference was found to be statistically significant. The table further revealed that Emotional eating score and stress score was highest in control group, 14.6±3.48 and 39.1±8.34 respectively whereas aesthetic game group scored highest in body shape concern. Control and strength group showed significant difference in all the three scores. Aesthetic game group scored higher EEQ and BSQ score when it was compared with endurance group. BSQ score was significantly differed in aesthetic game group vs. strength group and endurance vs. strength group respectively.

Table 2: Comparison of mean SD and level of significance of EAT-26, TMD, EEQ, Stress and Body shape concern of different sports and control groups

Parameters	Aesthetic game groups	Endurance	Strength	Control	F-value	Scheffe's test for multiple comparisons of different groups
EAT-26	18.0±5.11	11.9±4.27	13.4±4.41	18.1±4.90	15.35**	Con.vs. Strn.; Con.vs. Endu.; Aesth...vs. Strn..
TMD Score	10.1±3.54	11.5±7.89	14.4±4.53	8.9±5.79	6.30**	Con.vs. Strn.; Aesth...vs. Strn.
EEQ	13.7±2.68	11.6±2.49	12.3±2.79	14.6±3.48	7.74**	Con.vs. Endu.; Con.vs. Strn.; Aesth...vs. Endu.
Stress	22.4±2.90	20.1±4.83	19.0±4.85	22.7±3.37	6.89**	Con.vs. Endu.; Con.vs. Strn.; Aesth...vs. Strn.
Body Shape Concern	43.8±5.58	37.9±5.06	30.3±8.43	39.1±8.34	18.26**	Con.vs. Gym.; Con.vs. Strn.; Aesth.vs. Endu.; Aesth.vs. Strn.; Endu. vs. Strn.

*p<0.05; **p<0.01

3.3 Pearson's Correlation coefficients of various parameters

Table 3 represents the coefficient of correlation of different food groups with eating disorder parameters. The table demonstrated a significant positive correlations were obtained between BMI and EAT-26 ($r = 0.17$, $p < 0.05$) and significant negative correlation with fatigue ($r = - 0.25$, $p < 0.01$). Fast food was significantly and positively related with EEQ, stress, BSQ, EAT-26, and negatively with anger and fatigue. Result further showed that snacks was correlated positively and significantly ($r = 0.28$, $p < 0.001$; $r = 0.19$, $p < 0.05$) only with anger and depression. Diet scale, a subscale of EAT-26 showed a significant positive correlation with fast food consumption and negative relation with salad and raw vegetable intake. Other two subscale of EAT-26 showed no such significant relation with any of the foods staffs. Depression and sweet consumption also showed a significant positive correlation at the level of $p < 0.05$.

Table 3: Spearman Rank correlation coefficient of eating disorder parameters with different food groups

Parameters	BMI	Fast Food	Sweets	Snacks	Cakes cookies	Fruits	Salad Raw veg	Cooked veg	Soft drinks	Meat
EEQ	-0.07	0.27**	-0.13	-0.10	-0.05	-0.03	0.01	-0.05	0.19*	-0.01
Stress	-0.09	0.22*	-0.16	-0.16	-0.05	-0.04	0.05	-0.05	0.10	-0.01
BSQ	0.15	0.23**	-0.07	-0.09	0.06	-0.02	0.24**	0.06	0.01	-0.04
EAT-26	0.17*	0.27**	-0.05	-0.04	0.04	-0.07	-0.11	0.04	0.05	0.09
Diet scale	0.12	0.37**	-0.09	-0.04	0.12	0.08	-0.21*	0.12	0.09	0.03
Bulimia	0.14	0.12	0.00	-0.02	-0.01	-0.10	0.04	-0.01	-0.02	0.01
Oral control	0.12	0.12	-0.01	-0.02	-0.03	-0.13	-0.05	-0.03	0.03	0.13
TMD	-0.13	-0.11	0.12	0.13	-0.01	-0.01	-0.07	-0.01	-0.10	0.13
Tension	-0.13	-0.08	0.11	0.10	-0.04	0.02	-0.03	-0.04	-0.05	-0.02
Anger	-0.07	-0.20*	0.31**	0.28**	0.04	0.07	0.19*	0.04	0.00	0.11
Depression	0.02	0.01	0.21*	0.19*	0.11	0.06	-0.12	0.11	0.00	0.20*
Fatigue	-0.25**	-0.17*	0.01	0.02	-0.11	-0.13	-0.16	-0.11	-0.14	0.08
Confusion	0.12	0.26**	0.06	0.10	0.17*	0.23**	-0.09	0.17*	-0.08	0.11
Vigour	-0.01	0.01	0.17	0.16	0.08	0.11	0.05	0.08	0.02	0.01

3.4 Predictors of abnormal eating behaviour and perceived stress

Regression analyses for EAT scores and perceived stress scores revealed that total mood disturbance was a common contributor of the prediction of eating disorder and stress. Table 6 summarizes the results of the regression analyses. In athletes, Body mass index, Body shape concern and Total mood disturbance were the significant predictor of EAT scores (R^2 adj = 0.201, $F = 4.83$, $p = 0.000$). Emotional eating and Total mood disturbance was also the significant predictor of Perceived stress scores in athletes (R^2 adj = 0.621, $F = 26.68$, $p = 0.000$).

Table 4: Multiple regression analysis for possible predictors of EAT scores and Perceived stress

	R ²	Adjusted R ²	Beta	t-value	Sig.
EAT-26	0.254	0.201			
Body Mass Index			0.171	2.136	.035
Body Shape Concern			0.291	3.643	.000
Total Mood Disturbance			0.321	3.760	.000
Fast Food			0.204	2.471	.015
Perceived Stress	0.652	0.621			
Emotional eating Questionnaire			0.704	12.295	.000
Total Mood Disturbance			-0.216	-3.371	.000

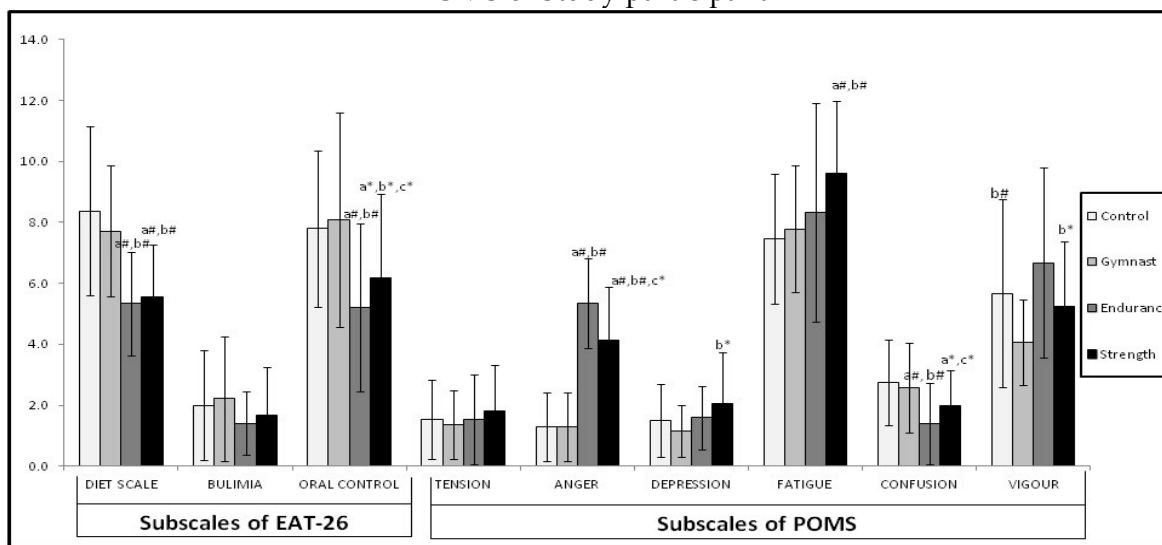
$p < 0.05$; ** $p < 0.01$

3.5 Subscales of EAT-26 and Profile of Mood Score

The subscales of EAT-26 and Total Mood Disturbance was demonstrated in figure 1. EAT-26 comprises three subscales including diet scale, bulimia and oral control. Among three, only bulimia did not show any significant difference whereas Diet scale score was significantly differed between control vs. endurance group, control vs. aesthetic game group, strength vs. control group and aesthetic game group vs. strength group. Control

group secured the highest diet scale score (8.4 ± 2.76) while endurance group exhibited the lowest score (5.3 ± 1.69). On the other hand aesthetic game group and endurance group showed highest (8.1 ± 3.52) and lowest score (5.2 ± 2.76) in oral control subscale respectively. Among all the subscales of total mood disturbance anger score was significantly differed from each and every group except control vs. aesthetic game group. Endurance group showed the highest score of anger (4.1 ± 1.76) and vigour and depression (2.1 ± 1.66) and fatigue score was highest in strength group.

Figure 1: Mean, SD and level of significance of different subscale of EAT-26 and POMS of Study participant

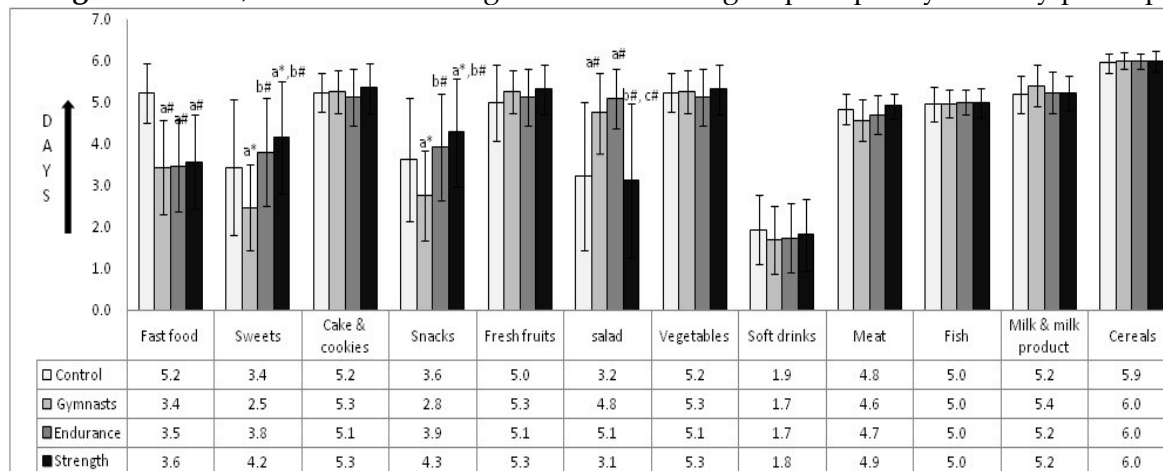


a = significantly different from group “control”; b = significantly different from group “aesthetic game group”; c = significantly different from group “endurance”; d = significantly different from group “strength” * = $p < 0.05$; # = $p < 0.01$

3.6 Frequency of different food group consumption among study participants:

Figure 2 describes weekly food intake frequency of different groups. Results revealed that control group consumed the highest number of fast food (7days/week) which was significantly more than other three groups. Strength group had the highest level of sweet consumption and also significantly higher than control and aesthetic game groups. The figure further revealed that other food intake pattern had no significant differences when compared among the groups.

Figure 2: Mean, SD and level of significance of food group frequency of study participants



a = significantly different from group “control”; b = significantly different from group “aesthetic game group”; c = significantly different from group “endurance”; d = significantly different from group “strength”; * = p<0.05; # = p<0.01

4. Discussion

Eating Disorders is a common psychological disorder in athletes especially in female population. Garner et al., 1983 reported that a Global EAT score of 20 identified individuals at risk of an eating disorder. In the present study, we have found that 36.2% of total subject was identified at a risk zone while 63.8% had no risk. If we consider only the athletic population, 22.2% of total subject was accounted for at risk group. Melin et al., 2015 also found that 25% of female athletes were under risk group. Another study has found that only 6.8% of female student athlete was susceptible for anorexia and 1.8% was bulimic (McLester et al., 2014). Sundgot-Borgen observed a higher prevalence of eating disorder in athletes (18%) than in non-athletes (5%) which is contradictory with our findings. (Sundgot-Borgen, 1993) However, contrasting results were observed may be due to different methodologies were used in different research study to assess eating behaviours of athletes. Differences in questionnaires, how questions are expressed, the onset and the duration of the behaviours are varied from study to study.

The level of athletes whether they are under elite group or junior level player or new comer in this field is also counted as a contributor for the above reason (Ferrand and Brunet, 2004). Present study also identified that aesthetic game group scored the highest mean EAT score (18.0±5.11) followed by Strength group (13.4±4.41). Oral control and diet scale score was also significantly high in control and aesthetic game group. It may be because , in weight category game athletes will not be allowed to compete if their weight is above the upper limit for that category and in case of aesthetic game group there is a direct connection between success and low body weight (Martinsen et al., 2010). The aesthetic part of the artistic game group is attached to a particular body composition which is then promoted and encouraged in competitors. This can create considerable pressure to achieve the necessary weight loss and often in a very short

period of time (Currie, 2010). Probably for these reasons, body shape concern is also high in athletes especially who play aesthetics games like aesthetic game group, synchronized swimming, dancing show a desire for thinness to achieve good result in competitions. These populations found to be more prone to eating disorders and precursory eating disorder behaviours (Fátima et al., 2003). If we focus on control group, BSQ score is also high among them which indicate even though body dissatisfaction concerns have been linked to female athletes; some female non-athletes also have similar or higher levels of body dissatisfaction than female athletes, which suggests that negative body image can be found among various female populations (McLester et al., 2014). We have also observed that there was a strong correlation with body shape concern and eating disorder. From the present study, it is clear that Body shape concern can be a strong predictor of disordered eating behaviour. This finding was corroborated with the previous research done by Petrie et al. 2009 and they have stated that individuals may have personality and psychological characteristics, such as their self-concept and satisfaction with their body and appearance, which affect their susceptibility to eating disorders (Petrie et al., 2009).

Elite competitors are directly and continuously exposed to both physiological and psychological stressors which can affect their mood status (Salvador and Costa, 2009). It is well documented that negative mood encompassing high anger, confusion, depression, fatigue, tension and low vigour and it is associated with an inability to cope with training demands. This study noticed that endurance and strength group both achieved high level of total mood disturbance score which is significantly different from other two groups. If we focus on subscales of POMS, it is evident that anger and fatigue score is markedly high in endurance and strength group than other two groups and which ultimately affect total mood disturbance score.

Nowadays Stress also becoming a growing concern among youth. We have found that all our study participants were suffering from moderate to high stress condition. This incidence was more prevalent in control group followed by aesthetic game group. Sports activity may have some positive effect on stress though the contradictions are also there (Matthew, 2014). Depending on the level of Stress, feeding behaviour can also change resulting in either increased or reduced food intake. Studies showed that palatable food has an ability to reduce stress induced complication on a short term basis (Singh, 2014). The present study also identified that a strong significant positive correlation between stress and fast food intake.

Former research reported an association between emotion, negative mood and eating disorders in sports (Macht and Simons, 2000; Hall and Lane, 2001). Though the exact mechanism by which emotions affect eating behaviour is still an unanswered question in the field of emotional eating (Macht, 2008). Previous research confirmed that emotions have an influential effect on food choice and eating habits (Paque et al., 2003; Garaulet et al., 2012). Emotional eating can be defined as "*eating as a response to a range of negative emotions, such as anxiety, depression, anger and loneliness*" (Faith et al., 1997). Moreover depending on the state of negative emotions or distress, emotional

eating is triggered where food intake can either increase or decrease within the same individuals. In our study, emotional eating is significantly prevalent among control and aesthetic game group groups while Kim Van Durme et al found that athletic group is more prone to eating disorders than general population (Durme et al., 2012). This contradiction may be noticed because our study control group found to be more concerned regarding their body image and dieting behaviour. Result further revealed that a strong significant positive correlation between emotional eating and stress and also with fast food consumption. This finding was found to be corroborated with the previous study as reported Sing et al (Singh et al. 2014).

5. Conclusion

The finding of this study revealed that controls and aesthetic game group exhibited more abnormal eating behaviours and high stress than other athletic population. Abnormal eating behaviours were associated with various psychological factors like mood, body dissatisfaction etc. Emotional eating identified as a strong predictor of perceived stress. Moreover, fast food eating positively correlated with abnormal eating behaviour and stress. Though controls groups showed more susceptibility to eating disorders, athletes were also engaged in detrimental eating behaviours. On the individual level, they should follow the mental training process to handle stress in a better way. A team of doctors, nutritionists and psychologists are needed to make them aware regarding healthy lifestyle and motivate them to manage competitive pressure.

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AN EXPLORATORY APPROACH

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