Title Page

PREVALENCE OF DISORDERED EATING IN ELITE FEMALE ATHLETES IN TEAM SPORTS IN GREECE

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ABSTRACT

The purpose of the study was to assess a) the prevalence of disordered eating (DE) in elite female team sports players compared to non-athletes and b) to compare DE prevalence in elite female players in basketball, volleyball and water polo. One hundred and seventy-five females were recruited (age 23.10 ± 5.4, BMI 21.85 ± 2.3 kg/m^2), 53 were elite basketball players, 42 were elite volleyball players, 34 were elite water polo players and 46 were non-athletes. Participants completed the Eating Disorders Questionnaire (EDE-Q) and a physical activity questionnaire. The EDE-Q incorporates 36 statements which relate to the occurrence and frequency of key behaviours of eating disorders, under the following four subscales: Restraint, eating concern, shape concern and weight concern and a global score of disordered eating. No differences were found in the EDE-Q subscale score and global score between athletes and non-athletes. Only 6.2% of the total number of participants exhibited DE using the global score >2.3. Water polo players had significantly higher scores in the 'eating concern' subscale and in the frequency of key behavioural features of DE such as binge eating episodes and objective and subjective bulimic episodes, compared to volleyball and basketball players. In conclusion, team sport elite female players do not exhibit greater prevalence of DE compared to non-athletes. Water polo, a sport that emphasizes leanness and control of body weight for international distinctions, is associated with a higher tendency to exhibit DE, when compared to other team sports.

KEYWORDS: Nutrition, Team Sport, Assessment, Behavior

INTRODUCTION

Athletes are advised to maintain an adequate and balanced food and fluid intake in order to stay healthy and injury-free and to maximize the adaptations to periodized exercise programs (Thomas, Erdman, & Burke, 2016). Unbalanced nutritional plans can lead to adverse body composition changes, reduced energy substrate availability, premature fatigue and overall decreased exercise performance during competition (Bangsbo, Nørregaard, & Thorsø, 1991). Despite the recognized importance of nutrition for athletic performance, numerous research studies have shown that a high percentage of athletes do not meet the energy requirements of their sport and often demonstrate negative energy balance and deficiencies in energy substrates, vitamins and minerals (Bratland-Sanda & Sundgot-Borgen, 2013; Giel et al., 2016). Particularly with female athletes, imbalances have been reported between energy intake and energy expenditure with inadequate consumption of carbohydrates and protein and reduced consumption of micronutrients such as calcium and iron, leading to detrimental effects on exercise performance and recovery (Farajian, Kavouras, Yannakoulia, & Sidossis, 2004; Papadopoulou, Papadopoulou, & Gallos, 2002). Most importantly, these nutritional imbalances have been associated with a high prevalence of disordered eating (DE) and a high risk of developing clinical eating disorders (ED) such as bulimia nervosa, anorexia nervosa and eating disorders not otherwise specified with dangerous effects on the health of the athletes (Martinsen & Sundgot-Borgen 2013; Torstveit et al. 2008; Gallahue & Ozmun 2006)

DE has recently been identified as a stepping stone in the development from restrictive eating and DE behaviors to clinical ED in athletic and non-athletic populations (Machado, Machado, Gonçalves, & Hoek, 2007; Martinsen & Sundgot-Borgen, 2013; Rosendahl, Bormann, Aschenbrenner, Aschenbrenner, & Strauss, 2009). ED refers to abnormal and unhealthy eating habits and behaviors with the goal of controlling or losing body weight and acquiring an 'ideal body type' (Jacobi et al., 2004). In athletic populations in particularly, it is

characterized by a range of adverse eating behaviors, such as increased anxiety over body image and weight, excessive exercising, poor kcal intake, fasting or restrictive eating practices, binge eating and use of dietary supplements, pills and laxatives (Dosil, 2008; Melin, Torstveit, Burke, Marks, & Sundgot-Borgen, 2014; Rice et al., 2016). A higher prevalence of DE and ED has been reported in athletes compared to non-athletic populations and in female compared to male athletes (Werner et al. 2013; Giel et al. 2016; Ferrand & Brunet 2004). EDs have also be found to be more prevalent in sports with weight categories such as martial arts and boxing and in sports where a lean body is considered a prerequisite both for aesthetic reasons but also to optimize performance such as gymnastics, long distance running, ice skating and recently aquatic sports such as swimming and synchronized swimming (Melin et al., 2014; Reinking & Alexander, 2005; Sundgot-Borgen & Torstveit, 2004; Werner et al., 2013). In these sports, athletes and especially females have been reported to be under extreme pressures and stress to attain a lean body size and very low body weight in order to compete at high level athletics (Thompson & Sherman, 1999). As a result, a higher prevalence of DE has been reported in higher level competitive athletes compared to lower level, recreational athletes (Werner et al., 2013).

Team sports such as football, basketball, volleyball traditionally have not been recognized as sports that body weight and body type and size is of determinant importance for athletic performance; hence it has been initially presumed that the risk of developing ED in these athletes is low in both males and females (Byrne & McLean, 2002; Giel et al., 2016; Reinking & Alexander, 2005; Werner et al., 2013). However, a number of studies in football and volleyball reveal a high ED and DE prevalence of up to 30% in these athletes (Beals, 2002; Haase & Prapavessis, 2001; Prather et al. 2016; Sundgot-Borgen & Torstveit, 2007; Wells et al. 2015; Williams et al. 2003). There is paucity of research on ED and DE prevalence in team sports such as basketball and water polo. The earlier start of systematic training in these sports

and the pressure that athletes receive from a younger age to participate in athletic competitions and 'succeed' are potential predisposing factors for the development of DE behaviors in these sports (Gallahue & Ozmun, 2006; Joy, Kussman, & Nattiv, 2016). More research is needed to assess the prevalence of eating disorders in female athletes in team sports and prevent potential adverse health and performance effects.

The aim of the present study was twofold. Firstly, to assess the prevalence of eating disorders in elite female team sports athletes compared to a non-athletic female population of similar age. Secondly, to investigate whether differences in ED prevalence exists in the elite female athletes of 3 different team sports: basketball, volleyball and water polo.

MATERIAL AND METHODS

Participants

A hundred and seventy five females in Greece volunteered to take part in the study. From this population, 129 females were elite level athletes from the premiere league of their sport and 46 females were non-athletes. From the athletic population, 53 females competed in basketball, 42 in volleyball and 34 in water polo. Athletes were recruited after communication with their coaches through emails and advertisements sent by the researchers. The control population consisted of female students of the University of Athens. Inclusion criteria for the control group were that participants were between the ages of 18-40 years old, inactive (exercising less than 3 days/week) and were healthy with no clinical diagnosis of eating disorders. The control population was recruited via posted signs in the University of Athens buildings and emails sent by the researchers. All participants signed an informed consent form

prior to participation in the study. All procedures were approved by the University of Athens ethics committee and conformed to the standards set by the Declaration of Helsinki.

Experimental Design and Measurements

All participants were visited in-person, informed about the aim of the study and signed an informed consent prior to the assessment. The validated Greek translation of the EDE-Q 4.0 was performed by the first author (Pliatskidou et al., 2012). Instructions were given to the participants on correctly completing the questionnaires. The completed questionnaires were returned back within a week. The physical activity questionnaire was completed only by the participants who were athletes. The physical activity questionnaire consisted of 9 demographic questions related to the sport profile and training programme of the athletes for the last 12 months (i.e. age that training commenced, type of sport, hours of training, days of training, years of training, presence of injury, missed training days due to injury, level of athletic participation, national team participation). The aim of this questionnaire was to categorise the sample (elite athletes only) to their related sport and distinguish them from the control group (non-athletes). Two questions on nutrition were also included in the questionnaire (i.e. have you received any nutritional advise from a professional in the last 12 months; have you been on a diet in the last 12 months) and two questions on regularity of the menstrual cycle (definition of 'regular cycle': recurring menstruation every 21 to 35 days) and one question on use or not of hormonal contraceptives in the last 6 months. The physical activity questionnaire was developed by the researchers. First an initial set of candidate questions was developed for inclusion in the questionnaire and then the questionnaire was piloted by being administered to a small sample of 40 participants (athletes and non-athletes) of the population of the University

of Athens student cohort in order to test the appropriateness of the questions and the correctness of the instructions included.

The EDE-Q 4.0 questionnaire consists of 36 food relating questions. Examples of the questions are 'During the last 28 days, has thinking about food, eating or calories made it very difficult to concentrate on things you are interested in (i.e. working, watching TV, following a conversation or reading?' and 'On what proportion of the times that you have eaten have you felt guilty (felt that you have done wrong) because of its effect on your shape or weight?'. The psychopathological behaviour and tendency to express eating disorders in the last 28 days is assessed in 4 subscales; Restraint (R) and Eating Concern (EC) are describing abnormalities in eating behaviour and Weight Concern (WC) and Shape Concern (SC) are measuring aspects of a negative body image. In addition, 4 items with diagnostic relevance related to the number of objective and subjective bulimic episodes, binge eating episodes, and driven or compulsive exercising (i.e. exercising for controlling shape, weight or amount of fat, or burning calories) are included in the questionnaire (Hilbert et al., 2012). Objective bulimic episodes are defined as eating an unusually large amount of food while experiencing loss of control of eating. Subjective bulimic episodes are defines as eating a small or moderate amount of food, that is perceived as large, while experiencing loss of control. Frequency or/and intensity are rated on six – point Likert scales (where 0 = feature was absent, which in term means the absence of pathology and 6 = feature was present every day to an extreme degree, which means severe pathology). The empirically derived Global Score threshold ≥ 2.30 was used as an indicator of ED (Hilbert, de Zwaan, & Braehler, 2012; Mond, Hay, Rodgers, Owen, & Beumont, 2004). Occurrence of all key behavioral features were dichotomized; ≥ 1 episode versus 0 episodes over the past 28 days, and ≥ 4 episodes versus < 4 episodes over the past 28 days respectively (Hilbert et al., 2012; Luce et al., 2008; Mond et al., 2004).

Statistical Analysis

Data were analysed using SPSS 17 (Chicago, USA). Descriptive statistics were used for the data analysis. A unpaired t-test was employed to compare the results of the two groups (athletes vs non-athletes) and an one way ANOVA to compare the results of the different sports in the continuous variables and a Fisher exact test to compare the groups in the categorical variables. For the analysis of any key eating behaviors, single key behaviors were analyzed only when effects were significant for total key behaviors. Statistical significance was set at $p < 0.5$. Data are reported as mean ± SD.

RESULTS

Subject Characteristics

Athletes were older and taller compared to non-athletes, and water polo players had a higher body mass and BMI compared to basketball and volleyball players ($P<0.05$) (Table 1). The mean number of years as a professional player was 3.4 + 0.8 years, with 45.0% of the athletes playing at national league level, and 35.1% being members of a national team in their sport.

Training & Injuries

The athletes trained on average 13.5 ± 0.3 hours per day for 4.0 ± 0.2 days per week. The water polo players were found to have more hours and days of training per week compared to the basketball and volleyball players ($P<0.05$). In particular, 47.1% of the water polo players were found to train more than 15 hours and 4 days per week. 65.2% of the water polo players were members of the national team of Greece compared to 26.3% for basketball and 52% for

volleyball players. Water polo players trained for an average of 6.3 +1.9 years compared to 9.0 +3.4 years for volleyball and 9.3+2.6 years for basketball.

79.1% of the athletes reported having missed training due to injury. A greater prevalence of injuries was found among basketball players (87.3%) compared to water polo players (65.2%) ($P<0.05$). No difference was found among the other teams in injury prevalence.

Nutritional Advice & Menstrual Cycle

66.1% of the total sample of athletes reported to have received advice on nutrition and weight loss compared to 70.2% of the non-athletes. 17.2% of the total sample of athletes reported being on a diet in the last month compared to 30.1% of the non-athletes. 86.6% of the athletes and 89.1% of the non- athletes reported having a regular menstrual cycle. None of the participants reported using hormonal contraceptives

Disordered eating psychopathology and prevalence

The majority of our athletic and non-athletic participants had a lower than 2.3 global score and partial score for each EDE-Q subscale, demonstrating a low risk for disordered eating. 6.2% of all participants revealed eating disturbances and athletes were five times more likely to reveal eating disturbances than non-athletes (5.1% versus 1.1%, respectively).

No differences were found in the EDE-Q subscales score and the global score between athletes and non-athletes ($P>0.05$) (Figure 1). However, in the EC subscale water polo players were found to have a higher score compared to the other 2 athletic groups ($P<0.05$) (Figure 1). No differences were found in the other 3 subscales between the athletes of the 3 different sports.

Key behavioral features of disordered eating

Overall from the total sample of participants, 55.4% reported in the questionnaire that they have consumed an unusually large quantity of food, 54.3% reported loss of control while eating, 54.2% reported binge episodes, and 56.1% reported compulsive exercise in the last 28 days. When we compared athletes and non-athletes, overall 56.5% of the athletes versus 50.4% of non-athletes reported DE symptoms, such as unusually large quantity of food, loss of control of eating, binge episodes and compulsive exercise. The frequency of the key behavioral DE features 'binge eating' and 'compulsive exercise' was higher in non-athletes compared to athletes ($P<0.05$) (Table 2).

When comparing the 3 different sports, differences were found between the athletes of the 3 sports regarding key behavioral features. Specifically, water polo players were found to have higher frequency of binge eating episodes ($P<0.001$), and objective as well as subjective bulimic episodes ($P<0.001$ and $P<0.01$, respectively) compared to the other athletic groups. No differences in any of the aforementioned parameters were found between volleyball and basketball players. No differences were found in the key behavioral feature of compulsive exercise between the 3 different sports ($P>0.05$).

Correlations between DE and subject characteristics and training history

Among athletes BMI and body mass was positively associated with all subscale scores and the EDE-Q global score (Table 3) ($P<0.05$). Age was negatively associated with WC-score and the EDE-Q global score, and years of training was negatively correlated with EC-score ($P<0.05$).

DISCUSSION

An increase in the prevalence of DE and clinical ED has been noted in sports worldwide, with female athletes demonstrating a greater risk for DE behaviours compared to male athletes (Werner et al. 2013; Giel et al. 2016; Ferrand & Brunet 2004). Aesthetic sports and sports with weight categories are traditionally recognized for their higher prevalence of DE due to the great emphasis and pressure for a lean body type and low body weight (Melin et al., 2014; Reinking & Alexander, 2005; Sundgot-Borgen & Torstveit, 2004; Werner et al., 2013). Moreover, it has been established that the higher the level of competition and success in sports, the higher the prevalence of ED (Werner et al., 2013). The present study focused on the understudied population of elite female team sport players. The findings of the present study demonstrate that elite female team sport players in Greece exhibit similar levels of DE with non-athletes. However, when comparing the different team sports, water polo players exhibit a greater eating concern score and higher frequency of DE key behavioural features such as binge eating and subjective and objective bulimic episodes compared to volleyball and basketball players.

In the present study, no differences were found in DE between our athletic and non-athletic population. There is a paucity of research on the prevalence of eating disorders in team sport female athletes (Sundgot-Borgen & Torstveit (2004). Our findings are in agreement with the study by Sundgot-Borgen & Torstveit (2004) in individual and team sport athletes, where no significant differences were reported in the prevalence of DE among athletes (22.4%) and non-athletes (25.9%). However, our results are in disagreement with previous studies showing a higher prevalence of DE and ED in athletes compared to non-athletes (Bratland-Sanda & Sundgot-Borgen, 2013; Sundgot-Borgen & Torstveit, 2004) or studies showing a higher prevalence of DE in non-athletes compared to athletes (Martinsen & Sundgot-Borgen, 2013; Rosendahl et al., 2009). Despite the lack of difference in DE between our athletes and non-athletes, we found a greater prevalence of dieting by 13% in our non-athletes compared to our

athletes. It is possible that female athletes might perceive that it is easier to keep a stable body weight when exercising compared to non-athletes Moreover, athletes might tend to primarily use exercise and sport participation versus dieting as a means to control their body weight, compared to non-athletic populations that rely more on dieting for body weight control.

Adverse eating and exercise behaviours such as binge eating, bulimic episodes and compulsive exercise are significant predictors of the future risk of developing eating disorders (Jacobi et al., 2004). In the present study, we found a higher, 56.5% prevalence of DE symptoms such as loss of control of eating, binge episodes, and compulsive exercise in our female athletes compared to the findings of earlier studies. Sundgot-Borgen & Torstveit (2004) have reported a 16% prevalence and Rosendahl et al. (2009) a 42% prevalence of DE in female team sport players. It is possible that the different methodologies employed in the aforementioned studies (Eating Disorder Inventory-EDI and interviews) in comparison to the present study (EDE questionnaire), can explain that large difference found in DE prevalence. Another possible reason is the elite competition level of our athletes that has previously been shown to be a determinant factor in DE development. The higher expectations and pressure for exercise performance improvements and successful results in elite level competition can lead to the greater development of DE behaviours such as excessive exercise in combination with restrictive dieting (Byrne & McLean, 2002). Future research should focus on the understudied population of female team sport players and include clinical interviews in conjunction with DE questionnaires to confirm the self-reported screening and further investigate the drivers of these athletes' disordered food consumption.

A novel finding of this study is the difference found in the prevalence of DE and key behaviours of DE between the athletes of the 3 team sports. Our findings have demonstrated that water polo players have a significantly greater prevalence of DE as evidenced by a higher

subscale score in eating concern compared to our volleyball and basketball players. Our results are similar to the findings of some earlier research studies, where aquatic sports such as swimming and synchronized swimming were found to have a higher prevalence of DE compared to other individual sports (Sundgot-Borgen & Torstveit, 2004; Torstveit et al., 2008). Participation and success in high level competition in aquatic sports has been traditionally related to a specific lean body type and a systemic control of body weight (Sundgot-Borgen & Torstveit, 2004), which could drive DE and exercise behaviours in these athletes. There is also evidence that athletes in aquatic sport such as swimmers are regularly pressured by coaches to diet and lose weight due to the display of their bodies in tight and revealing swim suits, thus potentially re-enforcing DE behaviors (Benson, Allemann, Theintz, & Howald, 1990). This is evident in our results, where a higher percentage of the water polo players exhibited key behaviours of DE such as binge eating and subjective and objective bulimic episodes compared to volleyball and basketball players. Moreover, we found a higher score in the "dietary concerns" subscale in the water polo players compared to the other 2 sports, further demonstrating the potential greater use of restrictive eating practices by these athletes compared to the other 2 team sports. It is important here to note that the water polo players in our study had the highest level of competition and national team participation compared to the other sports. Greece has a long standing tradition in water polo in males and females, with regular participation in international and Olympic events and high international ranking in female athletes, a parameter that adds extra pressure to the athletes to perform and is a pre-disposing factor for DE behaviours (Werner et al., 2013). Furthermore, the extremely high physical demands of water polo due to the high-intensity intermittent nature of the sport and the physical contact between the players, subjects water polo players to high levels of fatigue and psychological stress and demands a specific 'ideal' body composition of high body mass and lean body tissue that can increase the pressure to attain the 'ideal body type', negatively

affect the athlete's body image and increase the risk of DE (Fairburn & Harrison, 2003; Sundgot-Borgen & Torstveit, 2004). More research is needed in team sports to assess the effect that the different types of sport and level of competition can have on the female athletes' eating behaviour.

A positive linear relationship was found between BMI and body weight and the global score and subscale scores of DE in our female athletes. Specifically, we found that the higher the BMI and the body weight, the more disordered was the eating behaviour of the athletes. Such findings could explain the greater score in eating concern found in water polo compared to the other team players, as our sample of water polo players had a significantly higher body weight and BMI compared to the other athletes. Our findings are in agreement with the previous literature that has shown a strong positive correlation between body weight and DE (Gomez et al. 2011). Pre-occupation with body weight and body image and restrictive dieting is exacerbated in athletes with higher body weight (Martinsen & Sundgot-Borgen, 2013). More investigations are needed to assess whether team sport female players have greater concerns over body image and body weight compared to individual sports athletes.

Although it presents some important findings on the understudied population of female team sport athletes, the present study has some limitations that need to be acknowledged. Self-reporting of eating behaviours related to overeating and assessing large quantities of food is a recognized problematic methodical approach as participants tend to be biased in terms of assessment of their own quantities of food (Beaumant et al. 1993). Moreover, the reporting of DE behaviours is frequently associated with shame and feelings of guilt, which might affect the answers that the participants provide (Mond et al. 2004). The addition of clinical interviews could have strengthened the design of our study by complementing and validating our self-reported screening methodology.

In conclusion, the present study demonstrates that elite female team sport players exhibit behaviours of DE that are similar to behaviours reported in individual sports where a greater pressure for a lean body type and body weight is put on the athletes. In particular, water polo female players exhibit the greatest disturbances in eating behaviour and body image compared to volleyball and basketball players, possibly due to the greater exposure of the body of these athletes and the high pressure for elite level performances in their sport. Coaches need to be made aware of such problems and educate themselves on early prevention and treatment. Future research needs to further investigate the prevalence of DE in male and female team sport players and assess how competition level affects eating behaviour as well as how food consumption decisions of athletes (i.e. food shopping/section, pre-purchase evaluations and post consumption dissonance) mediate their DE. Future studies should also focus on the investigation and comparison of athletes in team sports versus weight sensitive sports within the same study utilizing the same methodological tools, in order to shed some light on the DE and ED differences between athletes of different sports.

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