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Research report

The prevalence of disordered eating and possible health consequences in adolescent female tennis players from Rio de Janeiro, Brazil

Gabriela Morgado de Oliveira Coelho [a,d,*], Maria Lucia Fleiuss de Farias [b], Laura Maria Carvalho de Mendonça [b], Danielli Braga de Mello [c], Haydée Serrão Lanzillotti [a], Beatriz Gonçalves Ribeiro [d], Eliane de Abreu Soares [a]

[a] Nutrition Institute, Rio de Janeiro State University, Maracanã, Rio de Janeiro, RJ 20550-900, Brazil
[b] Federal University of Rio de Janeiro, Ilha do Governador, Rio de Janeiro, RJ 21941-590, Brazil
[c] Physical Education College of Brazilian Army (EsEFEx, EB/RJ/Brazil), Urca, Rio de Janeiro, RJ 20291-090, Brazil
[d] Federal University of Rio de Janeiro, Macaé Campus, Granja dos Cavaleiros, Macaé, RJ 27930-560, Brazil

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ABSTRACT

The aim of this study was to estimate the prevalence of disordered eating and possible health consequences in adolescent female tennis players. This cross-sectional controlled study investigated the pubertal development (Tanner stages); body composition (dual energy X-ray absorptiometry-DXA); dietary intake (food record); presence of disordered eating (EAT-26, BITE and BSQ); menstrual status (questionnaire) and bone mineral density (DXA). The Female Athlete Triad (FAT) was divided into two severity stages. The study included 45 adolescents (24 athletes and 21 controls) at some pubertal developmental stage. The athletes exhibited better body composition profiles. We found that 91.7%, 33.3% and 25% of athletes and 71.4%, 9.5% and 33.3% of controls met criteria for disordered eating and/or low energy availability, menstrual irregularities and low bone mass, respectively. A greater percentage of athletes than controls presented with 1 and 2 FAT components (stage I), and 4.2% presented with the full syndrome. In conclusion, tennis players appear to present with more severe disorders than controls and should be monitored to avoid damage to their performance and health.

Introduction

Eating disorders (EDs) are behavioral syndromes that are associated with considerable morbidity and therefore one of the highest mortality rates among mental illnesses (Marquéz, 2008). These clinical mental disorders are defined by the American Psychiatric Association (APA, 2000) and the World Health Organization (WHO, 1992) as abnormal eating behaviors diagnosed by strict criteria. As a result of this stringency, the number of individuals with some pathological eating behavior is actually much higher than the number of people who are diagnosed with an ED.

Disordered eating (DE) is characterized by abnormal eating behaviors that do not meet all the criteria used to diagnose ED (Nattiv et al., 2007). Generally, DE is accepted as a subclinical ED and is screened for using self-reported scales (Vardar, Vardar, & Kurt, 2007). Therefore, the investigation of DE behaviors and the identification of at-risk groups are essential for the early recognition of problems, thus preventing possible complications (Quatromoni, 2008).

It is estimated that 95% of DE cases occur among women, and 90% of cases occur in people under the age of 25 (Deering, 2001; Espíndola & Blay, 2006). However, it is less clear whether the sports environment acts as a risk factor or a protective factor for DE development. The existing results are inconsistent and vary according to the method, level of athletic performance and sport studied (Coelho, Soares, & Ribeiro, 2010; Smolak, Murnen, & Ruble, 2000; Sundgot-Borgen & Torstveit, 2010).

The benefits of sports practice are undeniable, including increases in self-esteem that may serve as a protection against DE development by reducing feelings of body dissatisfaction (Ribeiro & Da Veiga, 2010; Vieira, Amorim, Vieira, Amorim, & Da Rocha, 2009). Conversely, the relationships of the athletes to the media, their idols in the sport, their coaches and their friends may all be risk factors (Scoffier, Maïano, & D'arripe-Longueville, 2010).

The pathways to the development of ED may be different for athletes than for non-athletes. For example, the demands of a sport to meet a particular body requirement, even in the absence of a high level of body dissatisfaction, may be sufficient for the

* Corresponding author.
E-mail addresses: gabimorgado@yahoo.com.br (G.M.O. Coelho), fleiuss@hucff.ufrj.br (M.L.F. Farias), laura.mendonca@uol.com.br (L.M.C. Mendonça), danielli.mello@globo.com (D.B. Mello), haydeelan@gmail.com (H.S. Lanzillotti), beatriz_ribeiro2004@ig.com.br (B.G. Ribeiro), eabreu@nutricao.ufrj.br (E.A. Soares).

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development of DE. For athletes, DE behavior may reflect their dedication to the sport (Byrne & McLean, 2002). Therefore, athletes try to achieve the "ideal body shape" for their sport to ensure optimum performance. This "ideal body shape" is generally mirrored in successful adult athletes in the sport. This can be a significant problem, especially for adolescent female athletes, who are experiencing puberty and thus may gain a significant amount of fat (Martinsen, Bratland-Sanda, Eriksson, & Sundgot-Borgen, 2010). Moreover, when the sport requires the exposure of a female's body and emphasizes flexibility and agility of movement, as is the case in tennis, it may present a risk for ED onset (Perini et al., 2009; Sundgot-Borgen & Torstveit, 2004).

The media constantly address the body weight and appearance of tennis players, and Australian players have reportedly been subjected to very restrictive diets and verbal abuse because of their body weights. However, to our knowledge, no studies published to date have investigated adolescent tennis players, specifically Brazilian players, individually or as an at-risk group, for DE development or screened them for major complications (Tennis Officials, 1998).

Possible health consequences include macronutrient and micronutrient deficiencies; changes in body composition with major changes in body mass and body fat percentage that may lead to the onset of menstrual irregularities (MIs), such as amenorrhea; and even problems that are speculated to be irreversible, such as bone demineralization and concomitant decreases in bone volume due to impairments in calcium and phosphorus deposition (Nattiv et al., 2007).

It is for these reasons that DE is included in the "Female Athlete Triad" (FAT), along with amenorrhea and bone demineralization (Nattiv et al., 2007). Factors closely associated with MI include low body weight and reduced body fat percentage, which can cause hormonal changes that lead to an imbalance in bone resorption and formation and may consequently modify bone mineral density (BMD) (Mottini, Cadore, & Kruel, 2008; Vigário & Oliveira, 2005).

The potentially irreversible consequences of these clinical conditions emphasize the need for early prevention, as well as for early diagnosis and treatment (Sherman & Thompson, 2006). Thus, the American College of Sports Medicine (ACSM) has recently updated its position regarding the FAT (Nattiv et al., 2007). This most recent document discussed the definitions of each of FAT component on a spectrum between health and disease. They also included low energy availability (LEA) as a new component, independent of DE, that may be a common mechanistic factor underlying each of the FAT components. However, within the four years after this change was introduced, only one study has estimated the energy availability in adolescent athletes compared with physically inactive individuals (Hoch et al., 2009).

In addition to these considerations, there is also a lack of controlled studies investigating the percentage of adolescent athletes and physically inactive individuals with different stages of the FAT spectrum (Torstveit, Rosenvinge, & Sundgot-Borgen, 2008), especially within the context of Brazilian sports. Therefore, the aim of this study was to estimate the prevalence of DE and possible health consequences while addressing the FAT spectrum in female adolescent tennis players compared to a control group of sedentary female adolescents.

Methods

Participants and procedures

This cross-sectional controlled study was conducted in Rio de Janeiro, Brazil. During the data collection period, from September 2009 to November 2010, the Tennis Federation of the State of Rio de Janeiro included approximately 50 teenage girls, ranging from 12 to 19 years in age. Of these girls, three lived abroad, 16 lived outside of Rio de Janeiro and two were not training with any coach or in any sports club, leaving only 29 players likely to participate in the study.

To identify athlete and control participants, screenings were performed in 17 tennis training sports clubs and in a private school in the city of Rio de Janeiro, respectively. Each site was contacted about conducting the research in its facilities prior to the screenings. The project was fully described to the tennis team coaches and to the school board to encourage participation.

To participate in the study, the tennis athletes had to compete in the sport, had to have been associated with the Federation and trained in the sport for at least 6 months (the minimum period for exercise adaptation) and had to train for a minimum of 9 h per week (Ratamess et al., 2009). The sedentary teenagers could not participate in any sports training, sports club, recreational sport or gym. To be considered sedentary, the teenagers had to participate in no more than 1 h of exercise per week, which was limited to physical education classes. Adolescents who were pregnant or breastfeeding; smokers; who had a history of polycystic ovary syndrome or hyperprolactinemia; or who used oral contraceptives, illicit drugs, corticoids and/or thyroid hormones were excluded from the study.

The participants (aged 18 years or older) or their legal guardians (for participants under 18 years of age) signed an informed consent document. This study was conducted ethically in accordance with the Declaration of Helsinki from the World Medical Association (WMA, 2000) and was approved by the local Research Ethics Committee (approval number 107/08).

On the first day of data collection, the participants filled out a characterization questionnaire (which included information about MI and physical activity), a pubertal development questionnaire, and received food records to fill out at home. On the second day of data collection, the participants submitted the completed food records, filled out the DE questionnaires and underwent body composition and densitometry examinations.

Evaluations

Pubertal development

Biological age was determined by self-assessment of pubertal Tanner stage (Marshall & Tanner, 1969) based on breast and pubic hair development. The accuracy of this self-report assessment has been validated previously, including with Brazilian teenagers (Duke, Litt, & Gross, 1980; Matsudo & Matsudo, 1994).

Body composition

The body composition of each adolescent (lean body mass and body fat percentage) was estimated using dual energy X-ray absorptiometry (DXA) (Lunar Prodigy Advance, GE/Lunar, Milwaukee, WI, USA). Participants were instructed to refrain from physical exercise for the 12 h preceding the examination.

Body mass (kg) was measured using a platform-type anthropometric scale (Filizola, Brazil) with graduations of 0.1 kg and a capacity of 150 kg. Height (m) was determined with a portable wall-mounted stadiometer (Personal Sanny) that was accurate to 0.1 cm. For the measurements, the teenagers wore minimal clothing, were barefoot and wore nothing on their heads. We used the procedures recommended by the International Society for the Advancement of Kinanthropometry (Marfell-Jones, 2006).

Diet

After an orientation with a nutritionist, 3-day food records were completed on alternating days at the participants' home at the