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Disordered eating behaviors among *CrossFit* athletes

Comportamento alimentar desordenado em praticantes de CrossFit

ABSTRACT

Objective: Evaluate differences in disordered eating symptoms between men and women who practice CrossFit and to evaluate its predictors in this population. **Methods:** A cross-sectional study (April to June 2019) was carried out with 194 adults (103 women and 91 men) enrolled in private CrossFit boxes in Brazil, with a mean age of 30.19 years (SD = 5.34). Participants answered a sociodemographic questionnaire, the Eating Attitudes Test-26 (disordered eating), the Sociocultural Attitudes Towards Appearance Questionnaire-3 (body-ideal internalization), and the Drive for Muscularity Scale (drive for muscularity). A series of Student's t-tests was applied to test differences in disordered eating symptoms between men and women. Multiple linear regressions were conducted to evaluate predictors of disordered eating for both sexes. **Results:** Women showed greater disordered eating symptoms, dietary restrictions and excessive concern about thinness than men. Moreover, younger women with a higher BMI are more likely to have disordered eating symptoms. Higher drive for muscularity and greater general body-ideal internalization were also associated with disordered eating among women. In men, muscularity-oriented behavior was the only predictor of disordered eating. **Conclusion:** These findings are relevant, as they point out that women who practice CrossFit seem to be a high risk group for the development of eating disorders. In addition, muscularity-oriented behaviors in men and the drive for muscularity, internalization of the ideal body, BMI and age in women are predictors of disordered eating in CrossFit practitioners.

KEYWORDS

Eating disorder, CrossFit, eating behavior, body image, physical activity.

RESUMO

Objetivo: Avaliar possíveis diferenças nos sintomas de transtornos alimentares entre homens e mulheres que praticam *CrossFit* e seus preditores nessa população. **Métodos:** Realizou-se um estudo transversal (abril a junho de 2019) com 194 adultos (103 mulheres e 91 homens) matriculados em academias de *CrossFit* particulares de Ribeirão Preto, com média de idade de 30,19 anos (DP = 5,34). Foram respondidos um questionário sociodemográfico, o *Eating Attitudes Test-26* (sintomas de transtornos alimentares), o *Sociocultural Attitudes Towards Appearance Questionnaire-3* (internalização do ideal de corpo) e a *Drive for Muscularity Scale* (busca pela muscularidade). **Resultados:** As mulheres apresentaram mais sintomas de transtorno alimentar, maiores restrições alimentares e preocupação excessiva com a magreza. Além disso, mulheres mais jovens com IMC mais alto têm maior probabilidade de apresentar sintomas de distúrbios alimentares. Maior busca pela muscularidade e maior internalização geral dos padrões de corpo socialmente estabelecidos também foram associados com alimentação desordenada entre as mulheres. Nos homens, o comportamento orientado para a muscularidade foi o único preditor dos transtornos alimentares. **Conclusão:** Esses achados são relevantes, pois apontam que as mulheres praticantes de *CrossFit* parecem apresentar maior risco para o desenvolvimento de transtornos alimentares. Além disso, comportamentos orientados para a musculatura em homens e a busca pela muscularidade, internalização do ideal de corpo, IMC e idade nas mulheres são preditores de transtornos alimentares em praticantes de *CrossFit*.

PALAVRAS-CHAVE

Comer transtornado, CrossFit, comportamento alimentar, imagem corporal, atividade física.

INTRODUCTION

CrossFit is recognized as one of the fastest growing modes of high-intensity functional training. According to the official *CrossFit* website (map.crossfit.com), *CrossFit* is a movement with over 5 million athletes and over 14,000 locations across 150 countries. Approximately 440 certified and registered *CrossFit* fitness centers and gyms exist in Brazil, totaling approximately 40,000 athletes[1]. The goal in *CrossFit* practice is to improve fitness, related to body mass, strength and anaerobic power, aerobic capacity, sport-specific skills, and experience[2,3].

Playing sport offers endless benefits, not just physical ones but also psychological and social ones that affect the well-being, health, and performance[4]. But the practice of physical activity based on motivational factors such as weight loss, attractiveness and muscle gain are directly related to body image disturbances, food restriction, body-ideal or appearance-ideal internalization[5], which may be detrimental to physical and mental health.

Previous studies show that a large part of *CrossFit* practitioners engaged in *CrossFit* due to esthetic reasons and body appearance and aims to improve the composition and distribution of body fat and muscle mass, as well as muscle hypertrophy through physical activity and alteration of food intake[6]. In addition to issues related to negative body image, these behaviors are risk factors for the development of eating disorders[7].

Eating disorders are psychiatric syndromes that are characterized by disorders in eating behavior and body image. They are usually associated with the practice of unbalanced, restrictive, or compulsive diets, and inadequate methods for weight loss, such as the use of laxatives, diuretics, excessive physical exercise, or induction of vomiting soon after food consumption[8]. In some cases, there is no presence of a serious disorder, but manifestations of unhealthy attitudes occur, a condition called *disordered eating*. Disordered eating behaviors include the use of medications for weight control, laxatives, the practice of excessive exercises without professional guidance/monitoring, the act of skipping meals or not eating, and obsession with counting the calories of the food consumed[9].

Risk factors for these behavioral health outcomes are disproportionately higher among some groups as adolescents, college women, and athletes and have been frequently observed in individuals across all demographic strata, including sex, age, social class, skin color, sexual minorities, and practitioners of some specific modalities of physical activity as *CrossFit*[10].

Considering that *CrossFit* is one of the fastest growing sports in Brazil and is a modality with great emphasis on body composition and appearance, and the scarcity of research on disordered eating in *CrossFit* practitioners; it is important to analyze whether men and women who practice this sport have dysfunctional eating behaviors, which can put them at greater risk for the development of eating disorders. So, the aim of this study was to evaluate differences in disordered eating symptoms between men and women who practice *CrossFit* and to evaluate the predictors of disordered eating in this population.

METHODS

Participants

The study is a cross-sectional, quantitative and had the participation of 197 individuals of both sexes, aged between 18 and 40 years (as most of the instruments were validated for use in populations within this age range), and be enrolled in the *CrossFit* modality in a specialized gym, with a minimum frequency of practice of 6 months (to ensure a minimum period in which participants would begin to exhibit the psychological and physical transformations of the practice). Participants were selected from a convenience sample, between April and June 2019 at a private *CrossFit* box located at São Paulo state, Brazil. Individuals who practiced other sports that favors hypertrophy in addition to *CrossFit* and belonging to special groups, such as pregnant or nursing women, individuals with any medical condition that could have a direct or indirect influence on physical appearance (e.g., AIDS, cancer, rheumatologic or autoimmune diseases, severe burns, bariatric surgery), elite athletes, were excluded.

Materials

Sociodemographic Characterization Questionnaire. It was developed by the researchers themselves for further characterization and stratification of the sample. Data such as sex, date of birth, weight, height, ethnicity, educational level, socioeconomic status, sexual orientation, marital status, and physical activity were requested.

Eating Attitudes Test (EAT-26)[11] (Brazilian version[12]). It has 26 items that assess the presence of eating disorders symptoms, distributed in three factors: (1) Diet – reflects dietary restriction for foods with high caloric value, food avoidance and excessive concern with thinness; (2) Bulimia and concern with food – it concerns episodes of excessive food intake, followed by pathological methods of body weight control; (3) Oral self-control – represents self-control in relation to food and evaluates the influence that the environment can exert on eating habits. Items are scored along a scale ranging from 0 (rarely, almost never and never) to 3 (always). The final score corresponds to the sum of the items, and item four is reversed. Higher scores indicate greater evidence of disordered eating behavior. A cutoff of 21 for total score also was used to identifying people at risk

of developing an ED In the present study Cronbach's alpha (α) coefficients were .78 for women and .81 for men.

The Sociocultural Attitudes Towards Appearance Questionnaire-3 (SATAQ-3)[13] (Brazilian version[14]). The questionnaire was developed to investigate body-ideal internalization. It has 30 items divided into four factors: (1) General internalization of socially established ideals – evaluates the endorsement and acceptance of media messages in relation to ideal standards of beauty; (2) Pressure exerted by these ideals represents how much individuals feel pressured to achieve these cultural ideas of beauty; (3) Athletic internalization – evaluates the endorsement and acceptance of media messages in relation to athletic appearance ideals; and (4) Media as a source of information about appearance – reflects the degree to which individuals use the media as a source of information regarding societal standards of attractiveness. The items are scored on a scale ranging from 1 (totally disagree) to 5 (totally agree). The final score corresponds to the mean of the items and higher scores indicate greater influence of sociocultural aspects on the individual's body image. In the present study Cronbach's α coefficients for the total scale were .97 for both men and women.

Drive for Muscularity Scale (DMS)[15] (Brazilian version: men[16], women[17]). The male scale has 12 items, divided into two factors: (1) Muscularity-oriented behaviors – represents behaviors in which men engage in order to become bigger and more muscular; and (2) Muscularity-oriented body image – reflects a body image that is oriented for muscularly. The female scale has 14 items in a single factor, which assesses attitudes and behaviors of concern with muscularity. Items are scored on a scale that ranges from 1 (always) to 6 (never). The final score corresponds to the sum of the items and higher scores indicate higher drive for muscularity. In the present study Cronbach's α coefficients for the total scale were .81 for women and .83 for men.

Procedures

The project was approved by the relevant Institutional Review Board (approval code: CAAE 2.552.1280). Potential participants were invited to complete a survey that was advertised as being on sport participation and well-being.

The participants were approached directly in several shifts by two trained research assistants, following a brief explanation of the project, those who agreed to participate were invited to take home a sealed envelope (which contained a written informed consent sheet, the survey materials with the order of presentation of scales counter-balanced, and debriefing information). The sealed envelopes were returned to researchers within 7 days. All participants took part on a voluntary basis and were not remunerated for participation. Three hundred and fifty envelopes were delivered, with the return of 313 completed surveys.

Statistical analysis

First, missing values were replaced using the mean replacement technique. Following the recommendations of Parent[18], 17 participants who were missing > 80% of data were excluded using listwise deletion method. Only the values of sociodemographic data were replaced using the series mean estimation method. To test differences between men and women in the EAT-26 total score and its three subscales, we conducted a series of Student's t-tests for independent samples. Effect sizes (Cohen's d) ≤ 0.20 were considered small, values ~0.30 were considered moderate, and Cohen's d ~0.50 were considered large. For exploratory purposes, we first ran a correlation test between all the study variables, separated by sex. We examined whether study variables predicted disordered eating behaviors, to do so, we conducted multiple linear regressions with age, BMI, drive for muscularity and body-ideal internalization as independent variables and the total EAT-26 score as criterion variable. Importantly, categorical variables were transformed into dummy variables, the analyses were separated by sex and the independent variables were determined from the correlations found between the total EAT-26 score and the other variables. Internal consistency of all measures (i.e., SATAQ-3, EAT-26, and DMS) was calculated. Cronbach's α > .70 was considered adequate. All analyzes were performed using SPSS version 26.0, with a significance level of < .05.

RESULTS

The study included 194 individuals (103 males and 91 females). The initial participant pool consisted of 313 men and women; however, data from 119 individuals were omitted because they did not meet inclusion or exclusion criteria (n = 111) or were missing substantial data (n = 8) (i.e., ≥ 20% of items missing on a given questionnaire).

The total participants had a mean age of 29.79 years (SD = 5.43). Most were White (86.1%, n = 167), single (55.2%; n = 107), heterosexual (90.7%; n = 176), with complete higher education (78.4%; n = 152), belonging to intermediate socioeconomic classes B and C (10.1%; n = 136). Self-reported height and weight were used to calculate Body Mass Index (BMI) (kg/m^2). The mean BMI was 27.72 kg/m^2 (SD = 3.06). The sociodemographic characteristics by sex are provided in Table 1.

Comparison test for independent samples between women and men participants showed no significant difference for age [t(192) = 1.09, p = 0.275, d = .157] but showed for BMI [t(192) = 8.54, p = 0.000, d = 1.23]. The sociodemographic description showed no significant difference between the distributions of race [χ^2(3) = 3.78, p = .151], marital status [χ^2 (3) = 8.44, p = .839], level of education [χ^2 (3) = 1.07, p = .783], and socioeconomic status [χ^2 (4) = 6.54, p = .162]. Sexual orientation was significant different between sex [χ^2 (4) = 10.62, p = .031].

Table 1. Demographic characteristics of participants by sex

	Men	Women	p^a
Inicial *N*	155	158	
Excluded *N*			
Exclusion criteria	51	60	
Missing data (>80%)	1	7	
Final *N*	103	91	
Age (years)			
M (SD)	30.19 (5.34)	29.34 (5.51)	.275
Range	18-40	18-40	
BMI (kg/m^2)			
M (SD)	26.22 (2.68)	23.01 (2.53)	.000**
Range	20.97-35.83	19.13-33.20	
Education level	**n (%)**	**n (%)**	
Middle school	3 (2.9%)	3 (3.3%)	.783
Undergraduate	21 (20.4%)	15 (16.5%)	
Graduate	61 (59.2%)	60 (65.9%)	
Others	18 (17,5%)	13 (14.3%)	
Race	**n (%)**	**n (%)**	
White	92 (89.3%)	75 (82.4%)	.151
Brown	9 (8.8%)	9 (9.9%)	
Yellow	2 (1.9%)	7 (7.7%)	
Socioeconomic status	**n (%)**	**n (%)**	
Class A	25 (24.3%)	11 (12.1%)	.162
Class B	33 (32.0%)	32 (35.2%)	
Class C	37 (35.9%)	34 (37.4%)	
Class D	6 (5.8%)	11 (12.1%)	
Class E	2 (1.9%)	3 (3.3%)	
Marital status	**n (%)**	**n (%)**	
Single	59 (57.3%)	48 (52.7%)	.839
Cohabiting	9 (8.7%)	10 (11.0%)	
Married	29 (28.2%)	29 (31.9%)	
Divorced	6 (5.8%)	4 (4.4%)	
Sex orientation	**n (%)**	**n (%)**	
Heterosexual	90 (87.3%)	86 (94.5%)	.031*
Homosexual	11 (10.7%)	2 (2.2%)	
Others	2 (2.0%)	3 (3.3%)	

Note: *p < .05, **p < .001. ^{a} Chi-square test among categorical variables and Student's t-tests for independent samples among continuous variable. BMI: body mass index. For socioeconomic status: Class A (above 20 minimum wages; wealthiest); Class B (10 to 20 minimum wages); Class C (4 to 10 minimum wages); Class D (2 to 4 minimum wages); Class E (earns up to 2 minimum wages; least wealthy).

Main analyses

The results showed that, on average, women have higher disordered eating symptoms (*M* = 14.98, *SD* = 9.37) compared with men (*M* = 12.05, *SD* = 8.68), *t* (192) = -2.26, *p* < .05, *d* = -0.32, and greater dietary restriction and excessive concern for thinness (*M* = 10.74, *SD* = 6.00; men: *M* = 8.43 *SD* = 6.00), *t* (173.21) = -2.36, *p* < .05, *d* = -0.34. There were

no significant differences on scores of the subscale "bulimia and concern with food" between men (*M* = 1.66, *SD* = 2.50) and women (*M* = 2.00, *SD* = 2.74), *t* (192) = -.90, *p* = .367, *d* = -0.13, neither on the subscale "oral control", *t* (192) = -.83, *p* = .406, *d* = -0.12 (men: *M* = 1.96, *SD* = 2.30; women: *M* = 2.24, *SD* = 2.39). Thirty-five participants (18.2%) scored above the EAT-26 cut-off point, suggesting a higher risk for developing eating disorders. In the analysis separated by sex, 25.3% (n = 23) of the women and 11.9% (n = 12) of the men had a positive EAT score.

Exploratory analyses

The results demonstrated that there were significant correlations between the total EAT-26 score and the drive for muscularity, pressure to be thin, general internalization, athletic internalization, age and BMI for women and with the general internalization, athletic internalization, muscularity oriented-behavior and muscularity-oriented body image for men (Table 2).

In women, the regression was significant, and age, BMI and drive for muscularity emerged as predictors (Table 3). Younger and heavier women were more likely to display disordered eating symptoms than older and thinner women. Higher drive for muscularity and greater general internalization were also associated with greater disordered eating symptoms.

For men, the results are shown in Table 4. The model was also significant, and the "muscularity-oriented behavior" subscale emerged as a predictor, meaning that the higher the behaviors in which men engage to become bigger and more muscular the higher the disordered eating symptoms.

DISCUSSION

This study aimed to evaluate differences in the disordered eating symptoms between men and women who practice *CrossFit* and to evaluate the predictors of disordered eating in this population. *CrossFit* women had higher disordered eating symptoms, dietary restrictions and excessive concern for thinness when compared to men. According to Podmore and Ogle[19], female athletes are at higher risk of controlling their weight through restrictive diets, prolonged fasting, and excessive exercise. The authors point out that when the participants in their study characterized their appetite and diet, they often discussed how their involvement in sports gave rise to various changes in their diet and decreased body satisfaction[19]. Men, on the other hand, show less body fat concerns than women, being more satisfied with their body appearance when compared to women[16].

Edmonds[20], and Podmore and Ogle[19], conducted qualitative research that demonstrated different experiences among *CrossFit* women practitioners. Some interviewed

Table 2. Pearson Correlation test for associations between EAT-26 and Additional Measures for the Main Sample

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. EAT-26 – Total	-	.93**	.76**	.52**	.43**	.39**	.30**	.34**	.17	.22*	.14	.01	.13	-.05	-.06	-.15	.12	-.01
2. EAT-26 – Diet	.94**	-	.58**	.26**	.40**	.40**	.24**	.33**	.15	.20*	.11	.06	.20*	-.04	-.03	-.06	.11	-.06
3. EAT-26 – Bulimia	.65**	.46**	-	.26**	.28**	.28**	.16	.30**	.13	.21*	.14	-.12	.19	-.13	-.14	-.14	.12	.15
4. EAT-26 – Oral Control	.27**	.04	-.05	-	.29**	.13	.34**	.09	.12	.08	.09	.00	-.23*	.01	.01	-.24*	.03	-.03
5. DMS – Total	.37**	.36**	.19	.12	-	.85**	.80**	.47**	.26**	.32**	.20*	-.18	-.06	.08	-.14	-.08	-.03	-.10
6. DMS – OB						-	.37**	.30**	.23*	.21*	.17	-.20*	.09	.07	-.11	-.09	-.02	-.09
7. DMS – OBI							-	.49**	.18	.31**	.16	-.10	-.21*	.08	-.13	-.05	-.05	-.09
8. SATAQ-3 – Muscular/athletic internalization	.28**	.24*	.26*	.08	.41**			-	.55**	.77**	.52**	-.19	-.01	.09	-.18	-.02	.09	.05
9. SATAQ-3 – Pressure to be thin	.35**	.35**	.25*	.02	.17			.62**	-	.75**	.45**	.06	-.04	.12	-.07	.16	.07	.01
10. SATAQ-3 – General internalization	.33**	.31**	.25*	.04	.24*			.67**	.82**	-	.50**	-.06	-.09	.09	-.07	.12	.06	-.07
11. SATAQ-3 – Media information	.19	.14	.13	.16	.18			.51**	.61**	.55**	-	-.16	-.07	-.03	-.19	-.07	.13	.04
12. Age	-.44**	-.39**	-.32**	-.17	.00			-.18	-.19	-.20	-.12	-	.23*	.11	.50**	.35**	-.09	.04
13. BMI	.25*	.32**	.09	-.12	.07			-.10	-.08	-.14	-.05	-.14	-	-.00	.08	.01	.05	-.20*
14. Race	-.13	-.17	-.01	-.00	-.09			-.01	-.15	-.10	-.07	.13	.14	-	-.00	.04	.01	.15
15. Marital Status	-.03	.00	-.06	-.07	-.03			.03	-.01	-.13	.04	.35**	.08	.07	-	.14	-.11	-.11
16. Educational Level	-.13	-.10	-.12	.08	-.03			.03	.08	.07	-.03	.52**	-.18	.08	.26*	-	-.16	.21*
17. Socioeconomic status	-.04	.04	-.08	-.17	-.05			-.02	-.07	-.02	-.06	.07	-.06	-.02	-.02	.03	-	-.16
18. Sexual Orientation	.06	-.08	.12	.32**	.11			.18	.12	.11	.15	-.02	-.13	.01	-.01	.12	.13	-

Note: Results for women are reported in the upper diagonal and for men in the lower diagonal. *p < .05. **p < .001. EAT-26: Eating Attitudes Test-26; DMS: Drive for Muscularity Scale; DSM – OB: muscularity-oriented behavior subscale; DSM – OBI: muscularity-oriented body image subscale; SATAQ-3: Sociocultural Attitudes Towards Appearance Questionnaire-3; BMI: body mass index.

Table 3. Hierarchical regression analysis with disordered eating as dependent variable among women (n = 91)

	Total R²	Δ R²	Δ F	β	t
Criterion: Eating Attitude Test – 26 F (5,85) = 11,40**					
Step 1	.23	.23	13.21**		
Age				-.42	-4.41**
IMC				.19	1.98
Step 2	.36	.13	17.40**		
Age				-.42	-4.85**
IMC				.16	1.85
DMS – Total				.36	4.17
Step 3	.40	.04	3.00*		
Age				-.38	-4.3**
IMC				.20	2.29*
DMS – Total				.32	3.47**
SATAQ-3 – Muscular/athletic internalization				-.57	0.57
SATAQ-3 – General internalization				.25	2.23*

Note: SATAQ-3 : Sociocultural Attitudes Towards Appearance Questionnaire-3. DSM: Drive for Muscularity Scale. * *p* < .05. ** *p* < .001.

Table 4. Hierarchical regression analysis with disordered eating as dependent variable among men (n = 103)

	Total R²	Δ R²	ΔF	β	t
Criterion: Eating Attitude Test – 26 F (4,98) = 6.72**					
Step 1	.18	.18	11.25**		
DMS – OB				.33	3.35**
DMS – OBI				.18	1.87
Step 2	.21	.03	1,97		
DMS – OB				.30	3.05**
DMS – OBI				.09	.85
SATAQ-3 – Muscular/athletic internalization				.25	1.62
SATAQ-3 – General internalization				-.06	-.42

Note: SATAQ-3: Sociocultural Attitudes Towards Appearance Questionnaire-3; DSM – OB: muscularity-oriented-behavior subscale; DSM – OBI: muscularity-oriented body image subscale. ** *p* < .001.

women reported that they felt pressured by their coaches or colleagues to follow restrictive or specific diets, such as "paleo", or a "cleaner diet" to improve their sport performance[19]. Others reported that they had engaged in a "healthy eating" since they started to practice CrossFit[20]. Regardless of how the interviewees categorize their diet plan, they still followed a specific diet, and this can be seen as a form of diet practice and dietary restriction, which are key elements of disordered eating[21].

Among men, muscularity-oriented body image is more prevalent than the desire for a thinner body. Therefore, men engage more frequently in muscularity-oriented disordered eating, which involves behaviors such as consuming a high amount of proteins and having strict rules in relation to mealtimes and/or frequency[22]. The EAT-26, which was developed to assess thinness-oriented disordered eating symptoms, may not be the best measure to assess these symptoms in males, as they neglect the disordered eating practices and characteristics linked to muscle concerns. This instrument was developed based on interviews with women diagnosed with eating disorders[11] and these peculiarities can also partially explain the differences found in this study between men and women.

The scores of the EAT-26 and subscales were lower in the present study when compared to studies carried out with clinical groups, except for the preoccupation with diet subscale[23-24], but higher when compared to elite soccer players[25] and bodybuilders[26]. These results suggest that, although the benefits of physical activity on quality of life and health are indisputable, some sports may favor dysfunctional behaviors, such as exercise dependence, strict control in food consumption, disordered eating practices and unhealthy weight control behaviors, contributing to the development of eating disorders. Thus, the results of the present study reinforce that CrossFit practitioners appear to be a high-risk group that deserves more attention.

The predictors of disordered eating for women were BMI, age, drive for muscularity and the general internalization of socially established ideals, and for men it was the muscularity-oriented behavior. CrossFit has become more and more popular all over the world and some studies show that the environment where this sport is practiced emphasizes the function of the body at the expense of appearance and encourages practitioners of the sport to have a healthy lifestyle[3,19,22]. However, disordered eating symptoms of are often observed among its practitioners.

Adherence to the practice of CrossFit and maintenance of the practice are related to psychological variables such as motivation and satisfaction of basic psychological needs, with the purpose of pleasure, challenge, and social belonging[27]. Regular physical activity can improve physical competence and external appearance, important factors in the development and maintenance of self-concept and self-esteem. Body awareness is central to self-concept and is connected with positive affect, well-being and daily functioning. Thus, the regular practice of CrossFit has numerous benefits; however, for some practitioners it can have its own detrimental effects on long-term health[28].

According to Lichtenstein and Jensen[29], the population practicing CrossFit is vulnerable to injuries since exercise addiction is prevalent among them. Moreover, the body-ideal internalization, the feeling of bodily inadequacy and body dissatisfaction can be the basis of disordered eating behaviors. Cross-sectional studies show that muscularity concerns and disordered eating are closely correlated with the practice of physical exercise, due to pressures related to sport and performance[30].

Murray et al.[31] pointed out that the drive for muscularity is related to the consumption of information and websites that give rise to unhealthy eating behaviors in people without pre-existing eating disorders, which can lead to increased body dissatisfaction and negatively affect the diet.

Much of the existing research on eating disorders and disordered eating has centered on the drive for thinness, which is most commonly seen in females. Coyne and Woodruff[7] provide initial evidence of the relationship between CrossFit practice and the woman's body image and disordered eating behaviors. Since muscle is located below body fat, girls and women who want to show off their muscles also need to have a low percentage of body fat. Furthermore, it has already been shown that the drive for muscularity in young adult Brazilian women is associated with disordered eating[15,17]. Furthermore, Freire et al.[32] revealed that body dissatisfaction is a determining risk factor for disordered eating and exercise addiction among fitness and CrossFit practitioners.

The findings of the present study may be relevant for health professionals, health promotion programs and community programs and future research, so that it is possible to better understand the disordered eating behaviors among CrossFit athletes. This is one of the few studies on disordered eating in CrossFit athletes. With these results in mind, coaches should pay attention to the possible presence of disordered eating within this population. Although performance is directly related to diet, some disordered nutritional strategies can impair this performance and increase the risk of eating disorders in athletes.

However, the study has some limitations. First, the sample may not be representative of the Brazilian population, as it was carried out in a single city in a single state. Second, there is a need to study other constructs, such as body dissatisfaction, which can predict other aspects of disordered eating in this population. Third, reported weight and height may be a bias, despite being a common finding in body image

and eating behavior studies. Finally, even though the EAT-26 is frequently used in Brazil, the measure is not validated for adults in the country. Moreover, the EAT-26 appears to be a more focused instrument for investigating the symptoms of disordered eating often seen in women, while recent studies have shown that disordered eating among men has its own characteristics[31].

CONCLUSIONS

In conclusion, our data suggest that women who practice *CrossFit* tend to have higher disordered eating, dietary restrictions, and excessive concerns about thinness than men. In addition, muscularity-oriented behaviors in men and the drive for muscularity, body-ideal internalization, BMI and age in women are predictors of disordered eating.

INDIVIDUAL CONTRIBUTIONS

Maria Carolina Franco da Cunha – Performed the writing of the manuscript, analysis and interpretation of data.
Alessandra Costa Pereira Junqueira – Designed the study, contributed substantially to the analysis and interpretation of the data, and reviewed the scientific content of the article.
Pedro Henrique Berbert de Carvalho – Reviewed the scientific content of the article.
Maria Fernanda Laus – Contributed substantially to the analysis and interpretation of the data and performed a review of the scientific content of the article.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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