

*Original Article (short paper)*

## What is more strongly related to disordered eating in male surfers, body fat or muscularity?

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**Abstract — Aims:** This study aimed to analyze the relationship between disordered eating (DE) and dissatisfaction with body fat and the drive for muscularity in male surfing athletes. **Methods:** The research included a sample of 175 surfers. The Eating Attitudes Test was used to assess DE. It was used the Body Shape Questionnaire to assess body dissatisfaction based on body fat. It was used the Drive for Muscularity Scale to evaluate the drive for muscularity. **Results:** The multinomial regression model showed a statistically significant association between DE and both body dissatisfaction based on body fat (Wald = 22.97, OR = 3.86) and the drive for muscularity (Wald = 12.38, OR = 1.84). **Conclusion:** It was concluded that there is relationship between body dissatisfaction based on body fat and DE. Likewise, there is relationship between drive for muscularity and DE in male surfers.

Keywords: body image; athletes; sport.

### Introduction

Restrained eating, binge-eating, self-imposed vomiting, the use of laxatives or diuretics and compulsive physical exercise are different forms of disordered eating (DE)<sup>1-2</sup>. Previously published findings indicated that the prevalence of DE ranges from 10% to 50% among athletes<sup>2-3</sup>.

Body dissatisfaction is associated with the adoption of DE<sup>3</sup>. Evidence indicates that athletes have a low level of body dissatisfaction<sup>4</sup>, but many athletes show concerns regarding their physical appearance.

In males, there appear to be two types of body dissatisfaction based on fat and muscularity<sup>5-6</sup>. There is some overlap between dissatisfaction with fat and drive for muscularity: with lower fat, there is higher muscularity.

Also noteworthy is that DE has an indirect relationship with body composition, particularly the body fat percentage<sup>3,7</sup>. In this sense, because the sports subculture considers body fat to be a negative aspect of performance<sup>4,8-9</sup>, athletes' body fat percentage can increase body fat dissatisfaction, which in turn shows a close relationship with the adoption of DE<sup>10</sup>. Other studies have shown a self-report measure of body dissatisfaction to relate to DE, but we also wanted to explore an objective measure of body fat and its relationship to DE. Thus, the body fat percentage is an important variable that should be evaluated in investigations of DE in athletes.

Although male athletes demonstrate a preoccupation with muscularity and body fat, we do not know which is more strongly related to DE in this population<sup>8</sup>. Evidence has shown a strong relationship between dissatisfaction with body fat and DE in male athletes<sup>3</sup>. However, there is still no evidence that the drive for muscularity is related to DE in this population. Notably, both the level of body dissatisfaction and the frequency of DE may vary by the type of sport<sup>4</sup>. More specifically, surfing is a nautical sport typically practiced on beaches in which athletes use rubberized clothes that emphasize their body shape.

According to Petrie et al.<sup>11</sup>, athletes with competitive sports uniforms that emphasize or expose their body shape, such as surfing, may be vulnerable to the onset of eating disorders. Most surfers have muscular shapes with low body fat. However, it is unclear whether these athletes are more concerned with body fat or muscularity. We note the lack of research on factors related to eating disorders in surfers. Surfing is a sport that is gaining followers worldwide and particularly in Brazil, which emphasizes the importance of assessing psychological aspects related to the public.

In general, studies have indicated that dissatisfaction with body fat and the drive for muscularity<sup>12</sup> are related to DE in men. However, no existing studies that analyzed the relationship between the drive for muscularity and DE in athletes. Given the above, the objective of this study was to analyze the relationship between DE and dissatisfaction with body fat and the drive for muscularity in male surfing athletes.

## Methods

### Participants

This cross-sectional study was conducted with male surfers. The convenience sample consists of 193 18- to 30-year-old volunteers. The surfers trained 2 hours per day on average, with a frequency of 4 times per week. To be included in the study, athletes needed to meet the following criteria: a) must be a surfing athlete for at least two years; b) must systematically train in surfing for at least 6 hours per week; c) must have participated in one of the steps of the Brazilian Surfing Circuit in 2014, which is organized by the Brazilian Surfing Federation; and d) must have a willingness to answer questionnaires and participate in anthropometric measurements.

However, 18 participants were excluded because they did not fully answer the questionnaires, did not participate in the anthropometric measurements, or were missing in any of the steps of the research. Therefore, the research included a final sample of 175 surfers. The power analysis value was .80, indicating an acceptable sample size.

After receiving information on the study procedures, the participants signed a consent form. This study was conducted ethically in accordance with the Declaration of Helsinki and was approved by the local Research Ethics Committee.

### Instruments

**DE measure.** To assess DE, we used the Eating Attitudes Test, which was validated for Portuguese language by Bighetti et al.<sup>13</sup>. The questionnaire consists of 26 questions divided into three subscales: (a) diet, which involves the pathological refusal of high-calorie foods and concern for physical appearance; (b) bulimia and food preoccupation, which involves episodes of binge-eating followed by purging behaviors for weight loss or control; and (c) oral self-control, which reflects self-control in relation to food and evaluates dietary intake as affected by environmental and social forces. For this study, it was used only the subscales of diet and bulimia and preoccupation with food. It was decided to not use the Oral self-control subscale because of their items are not directly associated with clinical symptoms of anorexia and bulimia nervosa. The higher the score, the higher the level of DE. It is still possible to classify respondents according to their risk for eating disorders, i.e., a score equal to or greater than 20 on the Eating Attitudes Test indicates a risk for eating disorders. In the validation study, Bighetti et al.<sup>13</sup> revealed the level of internal consistency to be .82. For the present sample, the internal consistency is .85 as assessed by Cronbach's alpha.

**Body dissatisfaction based on body fat measure.** It was used the Body Shape Questionnaire in its validated version for the Brazilian adult population<sup>14</sup> to assess body dissatisfaction based on body fat. The instrument has good internal consistency (Cronbach's alpha [ $\alpha$ ] = .97). For the sample of this study, the value of  $\alpha$  was .91, which demonstrates good uniformity. The self-report questionnaire consists of 34 Likert scale questions related to preoccupation with weight and physical appearance and specifically related to concerns regarding the amount of

body fat. A higher score indicates greater dissatisfaction with body fat. A score below 110 indicates no dissatisfaction, a score between 111 and 138 indicates mild dissatisfaction, a score between 139 and 167 indicates moderate dissatisfaction, and a score at or above 168 indicates severe body dissatisfaction. For the statistical analyses, we clustered the dissatisfaction ratings of "mild," "moderate" and "severe" as "Dissatisfied."

**Drive for muscularity measure.** It was used the Drive for Muscularity Scale to evaluate the athletes' drive for muscularity<sup>5</sup>. This scale consists of a self-report questionnaire that comprises 12 Likert scale items (ranging from 1 = never to 6 = always). The Drive for Muscularity Scale aims to assess the level of concern and desire to be more muscular. A higher score indicates a stronger drive for muscularity. The present study identified Cronbach's alpha to be .91. In our statistical analyses, it was used the average obtained by the participants on the Drive for Muscularity Scale (37.44 points) to divide the athletes into two groups: athletes with a score < 37.44 formed the "low drive for muscularity" group, and those with scores  $\geq 37.44$  formed the "high drive for muscularity" group.

Body composition was determined using the skinfold thickness technique by employing a skinfold compass trademarked by <sup>®</sup>Lange (USA), and this method used the chest, triceps and subscapular skinfolds according to the protocol of Jackson and Pollock<sup>15</sup>. For all these measurements, we used the pattern of the International Society for the Advancement for Kinanthropometry<sup>16</sup>. In our statistical analyses, we used the body fat percentage average (12.04) to divide the athletes into two groups, according to Fortes et al.<sup>8</sup> recommendations: athletes with a percentage < 12.04 formed the "low body fat percentage" group, and those with a percentage  $\geq 12.04$  formed the "high body fat percentage" group.

### Procedures

First, the researchers contacted the Brazilian Surfing Federation. The procedures and objectives of the study were properly explained, and authorization to collect data during competitive events was sought.

After receiving consent from the federation, a meeting was held with the surfers to clarify the ethical research procedures. The consent form was also distributed at this meeting, and the participants indicated their voluntary participation.

Data collection was performed at two different times at the competition sites (beach). At the first meeting, the athletes responded to the questionnaires, and the second assessment of anthropometric measurements was performed. The questionnaires were administered collectively and answered individually, with an average completion time of 25 minutes. Moreover, the presence of coaches was not allowed to prevent their influencing the responses of their athletes.

### Data analysis

We conducted the Kolmogorov-Smirnov test to evaluate the data distribution. Because there were no parametric violations,

a stepwise multiple regression was used to determine how the Body Shape Questionnaire (block 1) and Drive for Muscularity Scale (block 2) scores were related to the subscales of the Eating Attitudes Test. The body fat percentage was controlled for in some statistical tests. It was used a multinomial regression to analyze the association of dissatisfaction with body fat, the drive for muscularity and the body fat percentage with DE. The classifications “Satisfied”, “Low” and “High” of the BSQ, DMS and body fat percentage, respectively, were considered as reference criterion in the conduct of the multinomial regression model. We emphasized that these analyzes were performed based on the theory of Murray et al.<sup>17</sup>. Although the design of this study is cross-sectional, the use of multiple linear regression and multinomial regression was undertaken because these tests permit more robust analyses. It is noteworthy, however, that the cross-sectional design does not allow inference of causality. In this case, the analyses from this study allow us only to ascertain the existence of a relationship between DE and dissatisfaction based on body fat and the drive for muscularity. All data were processed using SPSS 21.0 software with a significance level of 5%.

### Results

The descriptive data of the sample of this study are showed in Table 1. Concerning the Eating Attitudes Test, 15% of the surfers reported DE (Eating Attitudes Test >20 points). Regarding the Body Shape Questionnaire, 20% of the athletes were revealed to have body fat dissatisfaction. Regarding the Drive for Muscularity Scale, 31% of the athletes demonstrated a “high drive for muscularity”.

Table 1. Descriptive Values (Minimum, Maximum, Mean and Standard Deviation) of Study Variables

Variable	Range	Minimum	Maximum	M	SD
EAT-26	0-78	0.00	45.00	18.15	10.91
BSQ	34-204	34.00	172.00	72.64	28.55
DMS	12-72	12.00	60.00	37.44	12.56
%BF	-	6.17	23.88	12.04	4.49
Age (years)	-	18.00	30.00	22.13	2.72

Notes: M = Mean; SD = Standard Deviation, EAT-26 = Eating Attitudes Test, BSQ = Body Shape Questionnaire, DMS = Drive for Muscularity Scale, %BF = Body Fat percentage.

The results of the first multiple regression model (Table 2) indicated a statistically significant relationship between the Diet subscale scores on the Eating Attitudes Test and both the Body Shape Questionnaire ( $F_{(1, 174)} = 39.60, R = .45, R^2 = .20, p = .001$ ) and Drive for Muscularity Scale ( $F_{(2, 173)} = 42.03, R = .27, R^2 = .07, p = .03$ ) scores. It is noteworthy that the body fat percentage was related to the Diet subscale scores on the Eating Attitudes Test ( $F_{(1, 174)} = 20.66, p = .04$ ).

The findings of the second multiple regression model (Table 3) indicated a statistically significant relationship between the Bulimia and Food Preoccupation subscale scores of the Eating Attitudes Test and the Body Shape Questionnaire

( $F_{(1, 174)} = 24.19, R = .36, R^2 = .13, p = .01$ ) but not with the Drive for Muscularity Scale ( $F_{(2, 173)} = 9.61, R = -.23, R^2 = -.08, p = .08$ ) score. However, it is noteworthy that the body fat percentage was related to the Bulimia and Food Preoccupation subscale scores on the Eating Attitudes Test ( $F_{(1, 174)} = 26.90, p = .01$ ).

Table 2. Multiple Linear Regression that used the BSQ and DMS on Diet Subscale Variance of the EAT-26 in Male Surfers.

Variable	Block	B	R	R <sup>2</sup>	R <sup>2</sup> *	IC R <sup>2</sup>	p value
BSQ	1	.25	.45	.20	.18	.16-.23	.001
DMS	2	.31	.52	.27	.25	.21-.30	.03
All		2.23	.55	.30	.29	.26-.36	.002

Notes: EAT-26 = Eating Attitudes Test, BSQ = Body Shape Questionnaire, DMS = Drive for Muscularity Scale, R<sup>2</sup>\* = R<sup>2</sup> adjusted, IC = Interval Confidence.

Table 3. Multiple Linear Regression that used the BSQ and DMS on Bulimia and Food Preoccupation Subscale Variance of the EAT-26 in Male Surfers.

Variable	Block	B	R	R <sup>2</sup>	R <sup>2</sup> *	IC R <sup>2</sup>	p value
BSQ	1	.18	.36	.13	.12	.08-.15	.01
DMS	2	.31	.23	.05	.03	.01-.08	.08
All		1.93	.28	.07	.05	.03-.10	.07

Notes: EAT-26 = Eating Attitudes Test, BSQ = Body Shape Questionnaire, DMS = Drive for Muscularity Scale, R<sup>2</sup>\* = R<sup>2</sup> adjusted, IC = Interval Confidence.

The multinomial regression model showed statistically significant associations between DE and all variables (Table 4): body dissatisfaction ( $X^2 = 34.90, Wald = 22.97, Odds Ratio = 3.86, CI (95\%) = 2.03 - 5.31, d = .7$ ), the drive for muscularity ( $X^2 = 23.42, Wald = 12.38, Odds Ratio = 1.84, CI (95\%) = 1.29 - 6.80, d = .5$ ) and the body fat percentage ( $X^2 = 29.7, Wald = 22.87, Odds Ratio = 2.07, CI (95\%) = 1.72 - 4.21, d = .5$ ).

Table 4. Multinomial Regression that used the Dichotomous Classification of BSQ, DMS and Body Fat Percentage for Evaluate the disordered eating Odds Ratio in Male Surf Athletes.

Variable	OR	CI (95%)	p value
<b>Body dissatisfaction</b>			
Satisfied	1.00	2.03 - 5.31	.02
Unsatisfied	3.86	-	
<b>Drive for muscularity</b>			
Low	1.00	1.29 - 6.80	.04
High	1.84	-	
<b>Body fat percentage</b>			
Low	1.00	1.72 - 4.21	.03
High	2.07		

Notes: OR = Odds Ratio, CI = Confidence Interval.

### Discussion

The study aimed to analyze how DE is related to dissatisfaction with body fat and the drive for muscularity in male surfing

athletes. The data in this study indicate that body fat dissatisfaction was a stronger risk factor for the development of eating disorders than was the drive for muscularity.

The findings of this survey indicated that 15% of the surfers studied reported DE. Other study conducted with athletes in sports that emphasize or expose body shape (e.g., swimming or track and field) corroborate these results<sup>6</sup>. Haase<sup>10</sup> states that the exposure of one's body to spectators can generate feelings of shame in an athlete, which may result in the adoption of DE to lessen the amount of body fat and maximize muscle volume. Investigations show that the high magnitude of negative feelings (shame) may predispose athletes to behaviors such as restrained eating, the use of diuretics or laxatives and compulsive physical exercise<sup>18</sup>.

The first block of the first multiple regression model showed a positive relationship between dissatisfaction with body fat and restrained eating. This result indicates that greater concerns regarding weight and body fat are associated with a higher frequency of food restriction in male surfing athletes. Surfers who feel uncomfortable with their weight and physical appearance often adopt restrained eating aimed at reducing their body fat. Moreover, it is noteworthy that long periods without food intake may attenuate muscle mass<sup>19</sup>, leading to a reduction in muscle strength and power, which are motor qualities considered essential for optimizing the performance of surfers. Thus, restrained eating can reduce the performance of competitive surfing athletes.

The second block of the first multiple regression model indicated a positive relationship with the drive for muscularity and restrained eating, but this relationship was small in magnitude ( $R^2 = .07$ ). This finding demonstrates that greater concerns about being more muscular are associated with a higher frequency of restrained eating. Surfers appear to believe that restrained eating may result in increased muscle volume, which is actually untrue. Notably, the increase in muscle volume in young adults (those over 18 years old) arises from physical training or diet<sup>19</sup>. A similar result was observed by Smith et al. (2011), who found an association between DE and both body fat dissatisfaction and the drive for muscularity.

The findings of the second multiple regression model revealed a positive relationship between dissatisfaction with body fat (block 1) and DE. This result indicates that greater concerns regarding body fat are associated with a higher frequency of purging and binge-eating in male surfing athletes. Thus, surfers dissatisfied with their level of body fat often engage in binge eating, self-induced vomiting, and/or an inappropriate use of laxatives and diuretics, which are considered to be drugs with deleterious health effects<sup>4</sup>. As Fortes et al.<sup>20</sup> note, athletes are pressured by coaches to maintain a stable weight and body fat amount throughout the competitive season, and in some cases, this expectation implies the periodic refusal of high-calorie foods (sweets). By contrast, some athletes may experience moments of emotional imbalance that can lead to binge-eating episodes<sup>10</sup>. Therefore, because of guilt, athletes commonly use self-induced vomiting, laxatives, diuretics or compulsive exercise to eliminate excess calories ingested.

Concerning block 2 of the second regression model, the findings showed no relationship between the drive for muscularity

and purging and binge-eating. This result indicates that surfers who were worried about being more muscular did not frequently binge eat, engage in self-induced vomiting or use laxatives or diuretics. Research shows that the typical behaviors of patients with a clinical diagnosis of bulimia nervosa typically do not induce increased muscle volume<sup>19</sup>. In this sense, according to Raudenbush and Meyer<sup>6</sup>, the use of dietary supplements and/or anabolic androgenic steroids is more common in male participants who seek to be more muscular, which cannot explain the observed relationship between the drive for muscularity and purging and binge-eating in surfers. However, according to some scientific evidence<sup>2</sup>, restrained eating can lead to binge-eating.

Regarding the multinomial regression, an association between dissatisfaction with body fat and DE was found. This finding indicates that surfers who are unhappy with their weight and body fat were 3.86 times more likely to show DE than were satisfied surfers. Other research on male athletes corroborates this finding<sup>2</sup>. Similarly, the multinomial regression showed a statistically significant association between the drive for muscularity and DE. This result demonstrates that surfers with a "high concern for muscularity" were 1.84 times more likely to show DE than were those with a "low concern for muscularity." According to the observations of Raudenbush and Meyer<sup>6</sup>, athletes who worry about being more muscular may be at risk for developing eating disorders, which may explain the association observed between the drive for muscularity and DE.

The multinomial regression also indicated an association between the body fat percentage and DE. The findings showed that surfers in the "high body fat percentage" group were 2.07 times more likely to engage in DE than surfers in the "low body fat percentage" group. This result is consistent with the findings of other studies<sup>10-11</sup>. In fact, overweight athletes show a greater vulnerability to DE.

This research sought to fill a small portion of the existing knowledge gap. However, this study also had some limitations. Although Murray et al.<sup>17</sup> argue in favour of classifying muscle dysmorphia as an eating disorder, the Eating Attitudes Test, which is an instrument for assessing DE, may not be sensitive to the assessment of eating behaviors typical of individuals with a high drive for muscularity (patients with muscle dysmorphia). Thus, future research should use sensitive instruments to assess these behaviors. Furthermore, some intervening variables related to DE were not evaluated, such as ethnicity, psychological dependence on exercise and socioeconomic level. Despite these limitations, it is believed that the present study delivers important findings that deserve to be discussed in the scientific literature.

## Conclusions

In summary, dissatisfaction based on body fat was more strongly related to DE than the drive for muscularity. Furthermore, the findings suggest that surfers dissatisfied with their body fat levels were more vulnerable to DE than those with a high drive for muscularity. Thus, the surfers who were more concerned with their amount of body fat appeared to be more vulnerable to the onset of anorexia and/or bulimia nervosa.

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