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Does Muscle Dysmorphy Predict Exercise Dependence and Orthorexia in Brazilian Exercise Practitioners?

Gabriel Lucas M. Freire[1,2], Yara Lucy Fidelix[2], Lenamar Fiorese[1], Leonardo de S. Fortes[3], Daniel V. de Oliveira[1], and José Roberto A. do Nascimento Júnior[2]

[1] Department of Physical Education, State University of Maringá (*Universidade Estadual de Maringá* [UEM])

[2] Physical Education Collegiate, Federal University of Vale do São Francisco (*Universidade Federal do Vale do São Francisco* [UNIVASF])

[3] Department of Physical Education, Federal University of Paraíba (*Universidade Federal da Paraíba* [UFPB])

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Author Note

Gabriel Lucas M. Freire https://orcid.org/0000-0003-0589-9003

Yara Lucy Fidelix https://orcid.org/0000-0003-2390-0565

Lenamar Fiorese https://orcid.org/0000-0003-1610-7534

Leonardo de S. Fortes https://orcid.org/0000-0002-0778-769X

Daniel V. de Oliveira https://orcid.org/0000-0002-0272-9773

José Roberto A. do Nascimento Júnior https://orcid.org/0000-0003-3836-6967

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Correspondence concerning this article should be addressed to José Roberto de Andrade do Nascimento Junior, Av. José de Sá Maniçoba, S/N, Centro, Petrolina, PE, Brazil. CEP 56304-205. Email: jroberto.jrs01@gmail.com

Abstract

This study aimed to analyze the predictive role of muscle dysmorphia symptoms in exercise addiction and orthorexia in 158 Brazilian exercise practitioners (running = 38, crossfit = 85, bodybuilding = 35) of both sexes (women = 81, men = 77), with a mean age of 31.59 years (± 7.99) and experience of 4.5 years (± 5.27). The Dedication to Exercise Scale, the Questionnaire for the Diagnosis of Orthorexia, and the Complex in Adonis Questionnaire were used. Data analysis was conducted through Pearson's correlation and multiple regression analysis ($p < .05$). It was found that the muscle dysmorphia symptoms predicted positively exercise addiction ($\beta = .51$, $p < .001$) and negatively orthorexia ($\beta = -.19$, $p < .01$), and it is important to discuss the issue with physical exercise practitioners in order to minimize the prevalence and deleterious effects associated with this psychological disorder.

Keywords: body dissatisfaction, binge-eating disorder, exercise, adult, cross-sectional studies

DISMORFIA MUSCULAR PREDIZ DEPENDÊNCIA DE EXERCÍCIO E ORTOREXIA EM PRATICANTES DE EXERCÍCIO BRASILEIROS?

Resumo

O estudo analisou o papel preditor dos sintomas de dismorfia muscular na dependência de exercícios e na ortorexia em 158 praticantes de exercício brasileiros (corrida = 38, *crossfit* = 85, musculação = 35) de ambos os sexos (mulheres = 81, homens = 77), com idade média de 31,59 anos (± 7,99) e experiência de 4,5 anos (± 5,27). Utilizou-se a Escala de Dedicação ao Exercício, o Questionário para o Diagnóstico de Ortorexia e o Questionário Complexo em Adonis. A análise dos dados foi conduzida por meio da correlação de Pearson e de análise de regressão múltipla ($p < 0,05$). A dismorfia muscular prediz positivamente a dependência de exercícios ($\beta = ,51$, $p < ,001$) e negativamente a ortorexia ($\beta = -,19$, $p < ,01$), sendo importante discutir a temática com praticantes de exercícios físicos a fim de minimizar a prevalência e os efeitos deletérios associados a esse distúrbio psicológico.

Palavras-chave: insatisfação corporal, transtorno da compulsão alimentar, exercício físico, adulto, estudos transversais

¿LA DISMORFIA MUSCULAR PREDICE LA DEPENDENCIA DEL EJERCICIO Y LA ORTOREXIA EN LOS PRACTICANTES DE EJERCICIO BRASILEÑOS?

Resumen

El estudio analizó el papel predictivo de los síntomas de dismorfia muscular en la dependencia del ejercicio y la ortorexia en 158 practicantes de ejercicio brasileños (carrera = 38, *crossfit* = 85, culturismo = 35) de ambos sexos (mujeres = 81, hombres = 77), con edad media 31,59 años (± 7,99) y 4,5 años de experiencia (± 5,27). Se utilizó la Escala de Dedicación al Ejercicio, el Cuestionario para el Diagnóstico de Ortorexia y el Cuestionario Complejo en Adonis. El análisis de los datos se realizó mediante la correlación de Pearson y el análisis de regresión múltiple. La dismorfia muscular predice positivamente la dependencia del ejercicio ($\beta = .51$, $p < .001$) y negativamente la ortorexia ($\beta = -.19$, $p < .01$) y es importante discutir el tema con los practicantes de ejercicio físico para minimizar la prevalencia y los efectos deletéreos asociados con este trastorno psicológico.

Palabras clave: insatisfacción corporal, trastorno por atracón, ejercicio físico, adulto, estudios transversales

The search for a beautiful and perfect body has been increasing in society nowadays, with the media and social networks daily pressing people to surrender to beauty stereotypes (Soler et al., 2013). It has led many of people to become dissatisfied with their own bodies and, consequently, triggered various psychological disorders and dependent behaviors on them (Longobardi et al., 2017).

One of the psychological disorders in evidence among exercise practitioners is muscle dysmorphia, a body dysmorphic disorder (Pope et al., 2005) in which the individual potentiates aesthetic body defects or imagines that has such defects (Longobardi et al., 2017). Such psychological disorder is related to suicidal intentions, worse life quality, and dependent behaviors, e.g., eating disorders, addiction to exercise, and a higher frequency of use of illegal substances, including anabolic steroid abuse (Pope et al., 2005). Although muscle dysmorphia is already considered a psychological disorder, some authors propose that it can be classified as an addiction, as the individual continues to engage in maintenance behaviors that cause long-term psychological damage (Longobardi et al., 2017; Corazza et al., 2019).

While studies have shown that women are more likely to develop thinness-related muscle dysmorphia, several evidences have been found about the higher prevalence of muscle dysmorphia among men, since they usually have the obsessive goal of achieving muscle hypertrophy with minimal body fat (Longobardi et al., 2017; Waldorf et al., 2019). Waldorf et al. (2019) found that men diagnosed with muscle dysmorphia showed more body image distortion, in addition to presenting a greater risk of social withdrawal and social comparison trends (Schneider et al., 2017). Although there is already research about the psychopathological mechanisms associated with muscle dysmorphia, such as types of eating disorders (Waldorf et al., 2019), there is still no consistent evidence regarding the role of muscle dysmorphia in some types of eating disorders, such as orthorexia. Eating disorders are influenced by a range of factors, such as consumption, disturbed dietary attitudes, and high concern with body aesthetics (Almeida et al., 2018; Segura-García et al., 2012). These eating patterns might become more extreme and cause adverse consequences for physical, social and psychological health (Almeida et al., 2018). Orthorexia is a frequent eating disorder among exercise practitioners, characterized by excessive concern with the consumption of healthy foods, which can trigger malnutrition and harm people's health, becoming pathological (Dunn & Bratman, 2016). The literature demonstrates a positive association between orthorexia symptoms and different variables, such as food pathology (Almeida et al., 2018; Segura-García et al., 2012), behavioral dimensions of the impulse for muscularity and exercise dependence (White et al., 2020), and dissatisfaction with physical appearance (Almeida et al., 2018).

The benefits of regular physical exercise, at all stages of life, are well-established in the literature (Trott et al., 2020). However, for some people, exercise can become excessive to the point of triggering negative social and physiological symptoms, such as injuries, withdrawal behaviors, and impaired social relationships. A recent systematic literature review estimated that

the prevalence rates of exercise addiction vary from 3% to 14.2%, depending on the population (Di Lodovico et al., 2019).

There is evidence that disorders related to body dissatisfaction, such as muscle dysmorphia, are risk factors for the development of dependent behaviors, such as addiction to exercise. However, there are few studies associating the symptoms of muscle dysmorphia with exercise addiction and symptoms of eating disorders, such as orthorexia (Dunn & Bratman, 2016; Trott et al., 2020), in exercise practitioners (Almeida et al., 2018). Research about muscular dysmorphia is usually conducted in selected samples, such as professional athletes or bodybuilders (Longobardi et al., 2017), which makes it impossible to infer data for other populations.

The literature in orthorexia, mainly concerning its prevalence, is dominated by European studies (Dunn & Bratman, 2016), and, in Brazil, given the high rates of physical exercise practitioners, the importance of studies about the risk of orthorexia is highlighted in order to raise awareness and prevent possible damage to health. Thus, the present study aimed to analyze the association of muscle dysmorphia with addiction to exercise and orthorexia in Brazilian amateur athletes. The hypothesis is that muscle dysmorphia will present a positive association with exercise addiction and orthorexia.

Method

Type of study

This study is a descriptive methodological research study with a transversal outline. The study was developed through the guidelines of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE).

Procedures

The procedures adopted in this research are according to the criteria of ethics in research with human beings established by the Resolution No. 466/12 of the National Health Council. Initially, contact was made with gym managers and crossfit boxers, in order to obtain authorization for data collection in Petrolina, Pernambuco, in Northeast Brazil. Then, the Research Ethics Committee of the Federal University of Vale do São Francisco approved the study under protocol No. 2.442.590. Only the individuals who signed the Free and Informed Consent Form participated in the study. The questionnaires were applied to the participants individually, in a private room, and participants took approximately 30 minutes to respond to them. To avoid bias in the application, questionnaires were randomized among the participants. Data were collected in March 2019.

Participants

The sample consisted of a total of 158 athletes (running = 38, crossfit = 85, and bodybuilding = 35), of both sexes (77 men and 81 women), with a mean age of 31.59 ± 7.99 years, experience of 4.50 ± 5.27 years, average practice time of 1.68 ± .87 years, and weekly

training frequency of 4.62 days ± 1.15. They were selected by convenience in the local gym facilities, in a non-probabilistic way. The inclusion criteria were: 1. being over 18 years old; 2. to be a physical exercise practitioner at the gym for at least three months; and 3. to regularly attend the gym at least twice a week.

Instruments

- Dedication to Exercise Scale (DES): validated for the Brazilian context, focusing on evaluating the dependence on exercise, its physical and psychological damages, and the implications of these damages to the daily lives of individuals. DES consists of 21 unidirectional items, answered on a six-point Likert scale, ranging from 1 (never) to 6 (always), distributed in seven factors (three items per factor): avoiding, continuity, tolerance, lack of control, reduction of other activities, time, and intentionality, and an overall score is made by summing all items. The Cronbach's alpha ranged from .76 to .87, indicating strong reliability (Hair et al., 2019).
- Questionnaire for the Diagnosis of Orthorexia (ORTO-15): it has been frequently used to measure orthorexia and proposes to evaluate the frequency of concern with eating too healthy and the level of pathological obsession with correct eating, which can lead to important food restrictions. ORTO-15 consists of 15 items, which are responded to on a four-point Likert scale, ranging from 1 (always) to 4 (never), and a total score below 40 is indicative of orthorexia. ORTO-15 is a one-dimensional instrument, and the score ranges from 15 to 60. It was adapted and validated for the Brazilian population, with evidence of the validity and reliability of the instrument. The Cronbach's alpha for the instrument was α = .70, indicating strong reliability (Hair et al., 2019).
- Complex in Adonis Questionnaire (CAQ): it was developed for the Brazilian population and aims to identify signs and symptoms related to muscle dysmorphia. It consists of 13 items with three response options for each item. The participant must indicate the alternative closest to their reality. The result corresponds to the simple sum of the scores of the questions, with four classifications: 1-2: mild to moderate; 3: serious problem; and 4: big serious problem. The Cronbach's alpha for the instrument was α = .71, indicating strong reliability (Hair et al., 2019).

Statistical analyses

Data analysis was conducted through descriptive and inferential statistics. Pearson correlation was used to investigate the relationship between addiction to exercise, orthorexia, and muscle dysmorphia. Linear regression analysis was used to determine whether muscle dysmorphia might predict the exercise addiction subscales and orthorexia. Nine models were conducted using the enter method to insert the variables to investigate the predictive role of muscle dysmorphia (independent variable) on scores of dependent variables: addiction to

exercise subscales (eight models) and orthorexia (one model). Data were screened to ensure that assumptions of normality, linearity, multicollinearity, and homogeneity of variance-covariance matrices were met. Data showed normal distribution and variances were equal. There were no sufficiently strong correlations between variables that indicate problems with multicollinearity (variance inflation factors [VIF] < 5.0). All analyses were performed through Statistical Package for the Social Sciences (SPSS) version 22.0. In addition, a post hoc statistical power analysis in G*Power version 3.1.9 revealed our statistical power to be 99.9% based on our sample of 158 participants, a medium effect size (.15), and a .05 *p* value.

Results

Preliminary analyses

First, the data were screened for missing values. There were no missing values in the dataset, as the lead researcher had ensured all surveys were completed during data collection. The data were then screened for univariate and multivariate outliers, with no outliers found within the sample. Finally, the data were screened for normality. The skewness values ranged from -.33 to .65 and the kurtosis values ranged from -.85 to .38, indicating reasonable normality.

Descriptive analysis

Table 1 presents the means, standard deviations, scale ranges, and correlations for all variables. The mean scores on the six-point Likert scale of the DES revealed that exercise practitioners realized that they were not developing exercise dependence. The mean scores from highest to lowest were as follows: lack of control (M = 3.82, SD = .76), avoid withdrawal symptoms (M = 3.37, SD = .87), tolerance (M = 3.18, SD = .96), intentionality (M = 2.51, SD = 1.12), time (M = 2.51, SD = 1.02), reduction of other activities (M = 2.38, SD = .86), and continuity (M = 2.20, SD = 1.04). Based on these scores and the total addiction to exercise score (M = 2.85, SD = .62). The mean scores on the four-point Likert scale of the ORTO-15 revealed that amateur athletes perceived they were orthorexia with the practice, the mean scores from (M = 33.68, SD = 3.94). The mean score of the CAQ was 9.55 (SD = 5.60).

The correlations revealed that reduction of other activities, lack of control, and overall score eating disorders were significantly and negatively associated with orthorexia (r range = -.14 to -.26). The correlations revealed that all dimensions of addiction to exercise were significantly and positively related to muscle dysmorphia (r range = .26 to .52).

Table 1

Correlation Between Addiction to Exercise, Orthorexia, and Muscle Dysmorphia of Amateur Athletes

Variables	Addiction to exercise								Ort.	MD
	1	2	3	4	5	6	7	8	9	10
1. Intentionality		.27**	.34**	.50**	.17*	.29**	.58**	.72**	-.04	**.30****
2. Continuity			.39**	.40**	.10	.23**	.37**	.61**	-.06	**.40****
3. Tolerance				.30**	.38**	.26**	.33**	.65**	-.06	**.42****
4. Reduction of other activities					.27**	.26**	.66**	.73**	**-.18***	**.32****
5. Lack of control						.20**	.16*	.45**	**-.26****	**.26****
6. Avoid							.22**	.49**	-.09	**.31****
7. Time								.74**	**-.14***	**.39****
8. Total score									**-.16***	**.52****
9. Ort.										-.15
10. MD										
M	2.51	2.20	3.18	2.38	3.82	3.37	2.51	2.85	33.68	9.55
SD	1.12	1.04	.96	.86	.76	.87	1.02	.62	3.94	5.60
Scale range	1-6	1-6	1-6	1-6	1-6	1-6	1-6	1-6	1-4	1-3

Note. Significant correlation: **$p < .01$; *$p < .05$. Pearson correlation.

MD = muscle dysmorphia; ort. = orthorexia. *SD* = standard deviation. *M* = mean.

Main analysis

Linear regression analyses (Table 2) revealed that our nine models, which included muscle dysmorphia, explained a significant part of the variance of all subscales of addiction to exercise (r^2 range = .05 to 25, $p < .05$). Muscle dysmorphia made the largest positive contribution to total score (β = .51, $p < .001$), tolerance (β = .41, $p < .001$), time (β = .38, $p < .001$), continuity (β = .39, $p < .001$), intentionality (β = .31, $p < .001$), reduction of other activities (β = .30, $p < .001$), avoid withdrawal symptoms (β = .29, $p < .001$), and lack of control (β = .24, $p < .01$). These results indicate that an increase of one standard deviation in the muscle dysmorphia unit leads to an increase of .24 to .51 standard deviations in the exercise dependence subscale units, indicating that the increase in body dissatisfaction is associated with increased addiction to exercise.

Table 2

Muscle Dysmorphia as a Predictor of Addiction to Exercise and Orthorexia in Amateur Athletes

Predicted dimension	Adjusted R^2	F	β (CI)	Standardized β
Addiction to exercise				
Intentionality	.09	16.129***	**.06 (.03, .09)*** **	**.31**
Continuity	.15	28.576***	**.07 (.05, .10)*** **	**.39**
Tolerance	.16	31.548***	**.07 (.05, .10)*** **	**.41**
Reduction of other activities	.08	15.229***	**.05 (.02, .07)*** **	**.30**
Lack of control	.05	9.652**	**.03 (.01, .05)** **	**.24**
Avoid	.08	13.817***	**.05 (.02,07)*** **	**.29**
Time	.14	25.678***	**.07 (.04, .10)*** **	**.38**
Total score	.25	54.235***	**.06 (.04, .07)*** **	**.51**
Orthorexia	.03	5.802**	**-.13 (-.24, -.02)** **	**-.19**

Note. Only the unstandardized and standardized regression coefficients, which were less than our significance level of .05, are highlighted in bold. β = regression coefficient; CI = 95% confidence interval. *p < .05; **p < .01; ***p < .001.

Table 2 also demonstrated that muscle dysmorphia explained a significant amount of the variance of orthorexia (r^2 = .03; p < .01) with a negative contribution (β = −.19, p < .01). It indicates that muscle dysmorphia favors orthorexia in exercise practitioners. These results indicate that an increase of one standard deviation in the muscle dysmorphia unit leads to an increase of .19 standard deviations in the orthorexia units, suggesting that the increase in body dissatisfaction is associated with increased addiction to exercise.

Discussion

The main purpose of this study was to investigate the predictive role of muscle dysmorphia in addiction to exercise and orthorexia among Brazilian exercise practitioners. The results of this investigation may provide new information for future studies involving muscle dysmorphia, addiction to exercise, and orthorexia. The main findings revealed that muscle dysmorphia was significantly and positively related to all dimensions of addiction to exercise and that muscle dysmorphia favors orthorexia in exercise practitioners (Table 2).

Our main result confirms the hypothesis of this study since muscle dysmorphia positively predicted addiction to exercise in exercise practitioners, in line with the results in previous research (Soler et al., 2013). It is noteworthy that muscular dysmorphia was positively associated with all dimensions of addiction to exercise. It indicates that higher symptoms of muscular dysmorphia represent higher predisposition to practice exercises excessively, affecting social and occupational life. Further, individuals with high symptoms of muscle dysmorphia have more difficulties to reduce exercise intensity and frequency, even when the exercise is contraindicated. These results are in line with previous research in which muscle dysmorphia is considered an important mediator between exercise addiction and other psychological disorders and dependent

behaviors (Longobardi et al., 2017; Waldorf et al., 2019; White et al., 2020). Soler et al. (2013) compared the levels of muscle dysmorphia and exercise addiction between fitness practitioners and bodybuilders, observing similarities between both groups in the likelihood of developing symptoms, such as constant concern about body size and appearance intolerance. The authors highlight functional impairments in both groups, such as anxiety, depression, and loss of social and occupational commitments. In addition, it was found that a higher level of muscle dysmorphia was positively associated with addiction to exercise (Soler et al., 2013).

Corazza et al. (2019) explored the relationship between exercise addiction and body dysmorphic disorder in European exercise practitioners and identified a high risk of addiction to exercise in cases of body dysmorphic disorders. Similarly, Freire et al. (2020) verified the existence of a positive association between body dissatisfaction, addiction to exercise, and risky behavior for eating disorders in Brazilian exercise practitioners. Thus, our findings corroborate the literature demonstrating the predictive role of muscular dysmorphia in symptoms of addiction to exercise in amateur athletes. It is worth mentioning that although physical inactivity is one of the main factors associated with mortality, we cannot neglect the negative effects caused by excessive physical exercise on people's health, such as orthorexia, for example.

The results of the present study confirm the second hypothesis, indicating that muscle dysmorphia favors orthorexia in exercise practitioners. We can infer that there is a positive association between dissatisfaction with muscle volume and the compulsion to eat healthy foods. These results can be explained by the fact that amateur athletes seek a perfect body and, consequently, adhere to excessive healthy eating behavior. This result can also be explained by the fact that amateur athletes suffer from the search for the perfect body in their respective modalities, which may end up causing orthorexia and other dependent behaviors (Dunn & Bratman, 2016; Segura-García et al., 2012). Amateur athletes with less acceptance of their own bodies are more physically active and, consequently, more susceptible to developing risky behavior for eating disorders, such as orthorexia. Another study conducted by Murray et al. (2017) revealed a significant association between muscular dysmorphia and eating disorders, also indicating that men with symptoms of muscle dysmorphia demonstrated some distortion of body image, eating disorder, and addiction to exercise.

In a recent meta-analysis, Badenes-Ribera et al. (2019) showed findings about the association between muscle dysmorphia and eating disorders, indicating that higher levels of muscle dysmorphia were related to greater eating disorders symptomatology. Fortes et al. (2016) found similar results showing that body dissatisfaction is a predictor of risky behaviors for eating disorders among Brazilian athletes. It is worth mentioning that a strict diet and a physical training program are important for individuals who wish to increase muscle mass (Longobardi et al., 2017; Soler et al., 2013; White et al., 2020), however, it can become problematic when the desire for muscle becomes an obsession (e.g., muscular dysmorphia) (Longobardi et al., 2017; Soler et al., 2013; White et al., 2020). Thus, it is essential that strength training professionals are

aware that adults who practice resistance training or aesthetics exercises, as part of the sample in this study, may be at increased risk for muscle dysmorphia and eating disorders.

Thus, our findings reveal that muscle dysmorphia can be considered a harmful factor for physical and mental health since it can lead to the adoption of dependent behaviors, such as addiction to exercise and orthorexia (Di Lodovico et al., 2019; Trott et al., 2020). Previous research points that body dissatisfaction, such as muscular dysmorphia, can initiate several problems related to physical, mental, and social health, including abuse of ergogenic substances, anxiety, depression, suicide, and risky behavior for eating disorders (Murray et al., 2017; Mitchell et al., 2017).

In this study, it was identified that the combined use of questionnaires can provide useful information to health professionals for the early detection of problems related to body image and dependent behavior in exercise practitioners. Another positive aspect of this study was the inclusion of practitioners of different types of physical exercises in the sample since most published studies evaluate a single type of exercise. However, it is important to note that this study is not without limitations. Firstly, we did not evaluate the frequency and intensity of physical training, which can influence dependent behaviors among exercise practitioners. Our second limitation refers to the cross-sectional design of this research, which does not allow us to know the real influence of muscle dysmorphia on addiction to exercise and orthorexia in the long term. There is also the possibility of selection bias among participants, as it is a convenience sample, although the results demonstrate relevant implications for the professionals involved with exercise prescription. Thus, future investigations should address a longitudinal design to identify the cause-effect relationship between these variables, assess frequency and intensity of physical training, and consider other types of exercise.

It can be concluded that muscle dysmorphia has a positive predictive role in addiction to exercise and orthorexia in Brazilian exercise practitioners. From a practical standpoint, the findings suggest some relevant implications for physical education professionals and health professionals who work with exercise practitioners. It is important to include the theme of muscle dysmorphia in the debate with exercise practitioners as a strategy to minimize its prevalence and the harmful effects associated with this psychological disorder. Since the frequency and intensity of physical training can have a mediating influence on the tendency to orthorexia, it is necessary for the physical education professional to be alert to the characteristics and behaviors of the athletes. It is also recommended that the exercise practitioners be accompanied by a multidisciplinary team since physical, nutritional, and psychological factors can affect performance and health.

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