Journal of Clinical Sport Psychology, **(Ahead of Print)**
https://doi.org/10.1123/jcsp.2019-0097

Human Kinetics
ORIGINAL RESEARCH
AROUND THE WORLD

Eating Behaviors Among Male Bodybuilders and Runners: Application of the Trans-Contextual Model of Motivation

Lisa Chaba
University of Teacher Education of the State of Vaud and Université Côte d'Azur

Stéphanie Scoffier-Mériaux and Fabienne d'Arripe-Longueville
Université Côte d'Azur

Vanessa Lentillon-Kaestner
University of Teacher Education of the State of Vaud

This article focuses on two popular sports that can put male athletes at risk of developing an eating disorder: bodybuilding and running. Bodybuilders concentrate on gaining muscle mass and runners on leaning body mass. Based on the trans-contextual model of motivation, this study aimed to better understand the psychological mechanisms underlying eating disorders in these athletes. In all, 272 male bodybuilders and 217 male runners completed measures of sport motivation, theory of planned behavior variables (i.e., attitude, subjective norm, perceived behavioral control, and intention to gain muscle mass/lean body mass), and eating disorders (dieting, control, and bulimia behaviors). The results revealed satisfactory fit indices for both samples. Autonomous and controlled motivations for sport were positively directly and indirectly related to eating disorders in these athletes. This motivational mechanism needs more in-depth investigation, and motivational profiles might help distinguish athletes with and without eating disorders.

Keywords: eating disorders, male athletes, self-determination theory, theory of planned behavior

Various sports have been associated with the risk of developing an eating disorder, including aesthetic sports (e.g., bodybuilding), endurance sports (e.g., running), sports with vertical movements (e.g., climbing), and weight category sports (e.g., wrestling) (e.g., Dosil, 2008). This article focuses on bodybuilding and running, two sports popular among male athletes, who are,

Chaba and Lentillon-Kaestner are with the University of Teacher Education of the State of Vaud, Lausanne, Switzerland. Chaba, Scoffier-Mériaux, and d'Arripe-Longueville are with the Université Côte d'Azur, LAMHESS, France. Chaba (lisa.chaba@hepl.ch) is corresponding author.

thus, at risk of an eating disorder (e.g., Chapman & Woodman, 2016; Devrim, Bilgic, & Hongu, 2018; Harris & Peterson, 2020). Bodybuilders focus on gaining muscle mass, whereas runners focus on leaning body mass (e.g., Murray et al., 2012; Olivardia, Pope, & Hudson, 2000). The purpose of this study was to gain deeper insight into the psychological mechanisms underlying eating disorders in male bodybuilders and runners from the perspective of the trans-contextual model of motivation (TCM) of Hagger and Chatsizarantis (2009), which integrates the self-determination theory (SDT; Deci & Ryan, 2000) and the theory of planned behavior (TPB; Ajzen & Madden, 1986).

Eating Disorders in Male Bodybuilders and Runners

Eating disorders refer to problematic eating behaviors that have been described in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (APA, 2013): anorexia nervosa (typical), restrictive food intake, bulimia nervosa (typical), binge eating disorder, other specified feeding or eating disorders (atypical anorexia nervosa, bulimia nervosa and binge eating disorder, purging, and night eating syndrome), rumination, and unspecified feeding or eating disorders.

Petrie and Greenleaf (2007) developed a theoretical model of eating disorders for athletes, and Tylka (2011) developed a quadripartite influence model of eating disorders for men. According to these authors, sociocultural factors (e.g., friends, family, partners, and media) combined with sports-related pressures (e.g., competitiveness and training regimens) or the internalization of an ideal physique may provoke body dissatisfaction, which in turn, may lead to eating disorders.

The studies on eating disorders in sport have mostly focused on female athletes (e.g., Ashley, Smith, Robinson, & Richardson, 1996; de Oliveira et al., 2017; Plateau, Arcelus, Leung, & Meyer, 2017), showing that female bodybuilders (e.g., Goldfield, 2009; Steele, Pope, & Kanayama, 2019) and runners (e.g., Quinn & Robinson, 2020; Sundgot-Borgen, 1993) are, indeed, at risk. Some studies have also shown similarities between females pursuing hyper-muscularity and females with anorexia nervosa (e.g., Goldfield, 2009; Murray, Rieger, Touyz, & De la Garza García, 2010). Although less prevalent, eating disorders in male athletes have also been reported (e.g., Harris & Peterson, 2020), and the study of Sundgot-Borgen (1999) showed that 20% of female athletes and 8% of male athletes are at risk of developing one. Male athletes may develop the same eating disorders as female athletes (e.g., Sundgot-Borgen, 1993), but they have also shown specific disorders related to, for example, the drive for muscularity (e.g., Chapman & Woodman, 2016; Fabris, Longobardi, Prino, & Settanni, 2018).

Bodybuilding and running are very popular among males (e.g., Chapman & Woodman, 2016; Devrim, Bilgic, & Hongu, 2018; Harris & Peterson, 2020). Both are individual sports that can be practiced freely without time constraints or dependence on others. They are low cost at the amateur and competitive levels and offer men a way to appear more attractive and affirm their masculinity (e.g., Çarpar & Şavran, 2019; Stempień, 2015). Nevertheless, they present some differences. In bodybuilding, which is gaining in popularity, athletes train

regularly to gain muscle volume and maintain muscle definition (e.g., Kinnunen & Vallet, 2018). In running, which is one of the most popular leisure sports (e.g., Stempień, 2015), thinness is an advantage for performance (e.g., Sudi et al., 2004). Thus, male bodybuilders and runners pursue different physical goals: gaining muscle mass and leaning body mass, respectively (e.g., Murray et al., 2012; Olivardia et al., 2000). Both these physical goals can lead to deviant behaviors, such as when excessive exercise disrupts work (i.e., less investment, reorientation) and social functioning (i.e., social isolation). Moreover, they may lead to disordered eating behavior (e.g., Murray et al., 2012; Olivardia et al., 2000).

Male bodybuilders have a profile similar to that of men with eating disorders (e.g., Mangweth et al., 2001; Murray et al., 2012). They exhibit obsessional preoccupations with body image because they have taken the cultural standards of bodily perfection to the extreme (i.e., bodybuilders are phobic about not having enough muscle, whereas individuals with eating disorders are fat-phobic), and they are generally more obsessional, perfectionistic, anhedonic, and pathologically narcissistic than the general population. They also display abnormal eating behaviors like food restriction, excessive exercise, and steroid use in pursuit of their goals (e.g., Chaba, d'Arripe-Longueville, Lentillon-Kaestner, & Mériaux-Scoffier 2018; Davis & Scott-Robertson, 2000).

Numerous studies on male bodybuilders have focused on muscle dysmorphia (e.g., Fabris et al., 2018; Palazón-Bru et al., 2018). This pathology is present when individuals perceive themselves as small and weak (e.g., Pope, Katz, & Hudson, 1993; Pope, Gruber, Choi, Olivardia, & Phillips, 1997). Muscle dysmorphia is officially classified as a subtype of the obsessive mental disorders and body dysmorphic disorders (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition; APA, 2013). However, muscle dysmorphia was originally called "reverse anorexia" (e.g., Pope, Katz, & Hudson, 1993), and some authors consider it an eating disorder based on the many similarities between the two (e.g., Murray et al., 2012; Nieuwoudt, Zhou, Coutts, & Booker, 2015). In parallel, running has regularly been linked to the development of eating disorders (e.g., Harris & Peterson, 2020; Murray et al., 2010; Murray et al., 2012) with runners vulnerable to an atypical form of anorexia nervosa (e.g., Murray et al., 2010; Murray et al., 2012) called "anorexia athletica" (Sundgot-Borgen, 1993). Both bodybuilders and runners may be prone to excessive eating behaviors to manage their weight, such as adhering to rigid diet plans, using diet pills, and vomiting (e.g., Murray et al., 2012). Deviation from a diet plan frequently results in marked anxiety and immediate attempts at compensation, like extra workout sessions (e.g., Pope et al., 1997).

Some studies have investigated eating disorders through the lens of SDT (Deci & Ryan, 2000). Leong, Madden, Gray, and Horwath (2012) showed that autonomous motivation for eating behavior is likely to facilitate healthier food habits and that intrinsic motivation increases an individual's desire to modify his or her eating disorder (Vansteenkiste, Soenens, & Vandereycken, 2005). Moreover, the study of Verstuyf, Patrick, Vansteenkiste, and Teixeira (2012) suggested that the SDT is a promising framework to more thoroughly study the motivational processes involved in eating regulation and associated problems.

The Trans-Contextual Model of Motivation

The TCM (Hagger & Chatzisarantis, 2009), a recent integrated approach that incorporates the SDT (Deci & Ryan, 2000) and the TPB (Ajzen & Madden, 1986), has shown its utility in investigations into the psychological mechanisms that underlie behavior. The rationale for this integration is that the SDT provides information on the origins of the sociocognitive variables that influence the behavior arising from the TPB. Similarly, the sociocognitive variables of the TPB delineate the mechanisms by which the motivational orientations from the SDT influence behavior. The integration is possible for three reasons: (a) the motivational orientations outlined by the SDT permit the creation of beliefs from the judgments in TPB; (b) the SDT describes an individual's perceived motivational orientation in a given context, whereas the sociocognitive variables of the TPB reflect an individual's expectancies regarding future behavioral engagement; and (c) the motivational orientations defined by the SDT need to be channeled into intentions toward specific behaviors that will service the goals and outcomes consistent with the orientation (e.g., Elliot, McGregor, & Thrash, 2002).

The integrated approaches were designed to provide more comprehensive explanations of the factors and mechanisms that influence health-related behaviors. Hagger and Chatzisarantis's (2009) TCM has mainly been applied in studies on physical activity and physical education (e.g., González-Martí, Bustos, Hernández-Martínez, & Jordán 2014), education settings (e.g., Hagger & Chatzisarantis, 2016), healthy eating behaviors (e.g., Girelli, Hagger, Mallia, & Lucidi, 2016), doping intention (Chan et al., 2015), and the drive for muscularity behaviors of male bodybuilders (Chaba, d'Arripe-Longueville, Lentillon-Kaestner, & Mériaux-Scoffier, 2019).

All of these applications have shown that motivations influence behaviors by direct and indirect paths via the sociocognitive variables of the TPB. They have shown that the indirect relationships are stronger than the direct relationships and that autonomous motivation is always more strongly associated with health-related behavior than controlled motivation.

Aim and Relevance of the Present Study

The aim of this study was to gain deeper insight into the psychological mechanisms underlying eating disorders in male bodybuilders and runners from the perspective of the TCM of Hagger and Chatsizarantis (2009). We hypothesized that the motivational orientations defined by the SDT would influence eating disorders in these athletes via the sociocognitive variables of the TPB (i.e., attitude, subjective norm, perceived behavioral control, and intention) and in relation to the desire to, respectively, gain muscle mass and lean body mass.

This study is relevant because bodybuilding and running are popular sports for male athletes and, thus, raise their risk of developing eating disorders, although bodybuilders try to gain muscle and runners try to lean body mass, two opposite goals. These sports have never been studied within the same theoretical and methodological framework, and no study on motivations for sport and other sociocognitive variables has been published in the context of bodybuilding and

running. The TCM might offer a heuristic theoretical framework to better understand eating disorders in men practicing these sports in relation to their opposite desires to gain muscle mass and lean body mass. The TCM has proved its efficacy to explain other health-related behaviors, but it has never been applied to eating disorders in these two populations. In this study, we focused on the role of the sociocognitive variables related to gaining muscle mass in male bodybuilders and leaning body mass in male runners in the motivational sequence that leads to eating disorders.

Based on the tenets of the TCM and related research (e.g., Chaba et al., 2019; Chan et al., 2015), this study tested the hypothetical model presented in Figure 1 and the following hypothesized pathways:

(a) Autonomous motivation for sport (AM) is negatively related to eating disorders (i.e., dieting, control, and bulimia behaviors) both directly and indirectly via the sociocognitive variables from the TPB (i.e., attitude, subjective norm, perceived behavioral control, and intention). Conversely, controlled motivation for sport (CM) is positively related to eating disorders, both directly and indirectly via the sociocognitive variables from the TPB, in male bodybuilders and runners.

(b) The direct relationship between CM and eating disorders is stronger than the direct relationship between AM and eating disorders. The relationship between CM and dieting and control behaviors is stronger in male runners, whereas the relationship between CM and bulimia behavior is stronger in male bodybuilders.

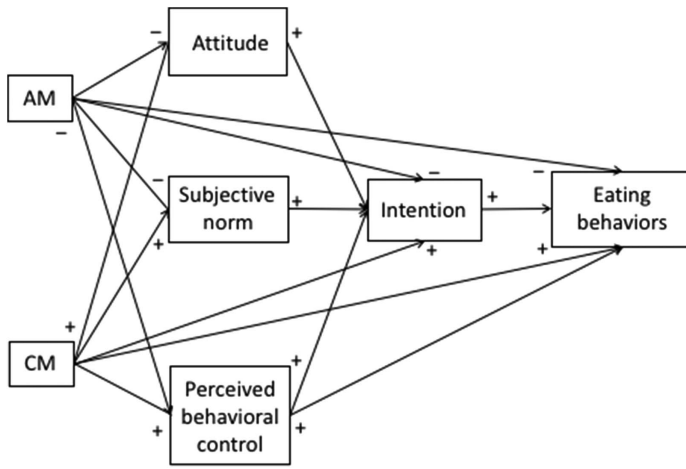

Figure 1 — Hypothetical application of the TCM of Hagger and Chatzisarantis (2009) on eating behaviors among male bodybuilders and runners. AM = autonomous motivation for sport; CM = controlled motivation for sport; attitude = attitude to gain muscle mass/lean body mass; subjective norm = subjective norm related to gain muscle mass/lean body mass; perceived behavioral control = perceived behavioral control related to gain muscle mass/lean body mass; intention = intention to gain muscle mass/lean body mass; eating behaviors = dieting, control, and bulimia behaviors; TCM = trans-contextual model of motivation.

(c) The indirect relationships between motivations for sport and eating disorders are stronger than the direct relationships.

Method

Participants

This study was conducted with two Swiss French-speaking male athlete samples. Participants were eligible to participate in this study according to the following criteria (Chaba et al., 2019): (a) minimum age of 16 years, (b) minimum of 3 hr of physical training per week, and (c) minimum of 3 years of bodybuilding or running. Volunteer participants were 272 male bodybuilders aged 17–57 years old ($M_{age} = 26.63$; $SD_{age} = 7.38$) who practiced their sport 3–24 hr per week ($M_{hr\ per\ week} = 6.73$; $SD_{hr\ per\ week} = 3.41$) and had been doing so for 6.85 years, on average ($SD_{number\ of\ years} = 6.71$). The study also included 217 male runners aged 17–72 years old ($M_{age} = 37.66$; $SD_{age} = 12.20$) who practiced their sport 3–25 hr per week ($M_{hr\ per\ week} = 6.44$; $SD_{hr\ per\ week} = 4.21$) and had been doing so for 11.93 years, on average ($SD_{number\ of\ years} = 10.12$).

Procedure

The ethics committees of the universities of Teacher Education of the State of Vaud and Université Côte d'Azur approved the protocol design and the study. Data for the study were collected over the course of 6 months, and participants were recruited through a social network, in gyms for bodybuilders, and/or at running competitions for runners. Written consent was obtained from the participants prior to participation (or their parents in the case of minors). The participants were invited to respond to a survey via e-mail, and the survey was provided via an online survey platform (LimeSurvey). Online questionnaire completion did not exceed 20 min, and responses to all questions were obligatory; there were no missing data. Participants were informed beforehand that the survey was not a test (i.e., there were no right or wrong answers) and that responses would be used for research purposes only. Participation was entirely voluntary and full confidentiality was guaranteed.

Measures

Demographic information was requested (i.e., e-mail address, the main sport, the main sport's training structure, number of years practicing the main sport, average number of training hours per week in this sport, age, competition or not, level of competition, and student and/or work status) before the main survey focused on sport motivation, the TPB variables, and the eating behaviors.

Sport motivation. Sport motivation was measured using 19 items from the French version of the Behavioral Regulation in Exercise Questionnaire (Markland & Tobin, 2004). In this study, and according to Ryan and Connell (1989), the prototypical form of autonomous motivation was represented by eight items corresponding to intrinsic regulation (four items; e.g., *I make sports because I like it)* and identified regulation (four items; e.g., *I appreciate benefits of sport*).

Controlled motivation was represented by seven items corresponding to external regulation (four items; e.g., *I practice because others will not appreciate that I don't do it*) and introjected regulation (three items; e.g., *I feel guilty if I don't play sport*) (Deci & Ryan, 2000). The items were answered on a Likert scale from 1 (*not true for me*) to 6 (*very true for me*). The Behavioral Regulation in Exercise Questionnaire has been shown to have good psychometric properties (Markland & Tobin, 2004). In the present study, the internal reliability of the autonomous and controlled motivation subscales was marginally acceptable for male bodybuilders ($\alpha_{AM} = .71$; $\alpha_{CM} = .69$) and runners ($\alpha_{AM} = .71$; $\alpha_{CM} = .64$). Following Briggs-Gowan and Carter's (1998) recommendations, Cronbach's alphas between .60 and .69 were considered as "marginally acceptable."

TPB variables. The items concerning variables of attitude, subjective norm, perceived behavioral control, and intention were developed according to Ajzen and Madden's (1986) recommended guidelines and adapted to the contexts of male bodybuilders and runners. Questions regarding participants' beliefs about gaining muscle mass/leaning body mass were integrated on the basis of previous work on the TPB (e.g., Courneya, 1995). A Likert scale from 1 (*not at all*) to 6 (*absolutely*) was used. For each scale, a confirmatory factor analysis (CFA) was computed, and Cronbach's alphas were performed to verify the internal consistency of each variable.

***Attitude*:** Five items related to the perceived benefits of gaining muscle mass/leaning body mass were used for, respectively, male bodybuilders (e.g., *I think I would be more self-confident if I had more muscle mass*) and runners (e.g., *I think I would be more self-confident if I was thinner*). The CFA provided good fit indices for the data, respectively, χ^2 (6) = 11.5, $p = .079$, Tucker–Lewis index (TLI) = .95, comparative-fit index (CFI) = .97, root mean square error of approximation (RMSEA) = .07; χ^2 (6) = 10.9, $p = .090$, TLI = .97, CFI = .98, RMSEA = .07; and satisfactory internal consistency ($\alpha_{bodybuilders} = .77$; $\alpha_{runners} = .82$).

***Subjective norm*:** Subjective norm related to gaining muscle mass/leaning body mass was measured through four items for male bodybuilders and runners, respectively (e.g., *My peers approve that I'm trying to increase my muscle mass and My peers approve that I'm trying to lean body mass*). The CFA provided a good fit to the data in both samples, respectively: χ^2 (2) = 2.8, $p = .245$, TLI = .99, CFI = .99, RMSEA = .05; χ^2 (3) = 4.8, $p = .186$, TLI = .98, CFI = .99, RMSEA = .06. The internal consistency of these subscales was marginally acceptable ($\alpha_{bodybuilders} = .66$; $\alpha_{runners} = .73$) (Briggs Gowan & Carter, 1998).

***Perceived behavioral control*:** Five items assessing the perceived behavioral control related to gaining muscle mass/lean body mass were used for both samples. For male bodybuilders (e.g., *I feel able to do intensive strength training*), the CFA provided a good fit to the data, χ^2 (7) = 11.8, $p = .108$, TLI = .97, CFI = .98, RMSEA = .06 and satisfactory internal consistency ($\alpha_{bodybuilders} = .78$). This subscale also had satisfactory fit indices for male runners (e.g., *I feel able to do endurance sports*), χ^2 (7) = 9.8, $p = .197$, TLI = .98, CFI = .99, RMSEA = .05 and satisfactory internal consistency ($\alpha_{runners} = .80$).

***Intention*:** Three items measured intention to gain muscle mass/to lean body mass for male bodybuilders and runners, respectively (e.g., *I intend to continue to do strength training to gain muscle mass and I intend to continue endurance sports*

to lean body mass). The CFA provided a good fit to the data for the two samples, respectively: χ^2 (1) = 1.5, p = .158, TLI = .99, CFI = .99, RMSEA = .05; χ^2 (1) = 1.96, p = .161, TLI = .96, CFI = .99, RMSEA = .08. The internal consistency for these scales was satisfactory for bodybuilders and marginally acceptable for runners ($\alpha_{bodybuilders}$ = .75; $\alpha_{runners}$ = .67) (Briggs-Gowan & Carter, 1998).

Eating behaviors. The eating disorders were measured using the Eating Attitudes Test (EAT-26; Leichner, Steiger, Puentes-Neuman, Perreault, & Gottheil, 1994) with a Likert scale from 1 (*not at all*) to 6 (*absolutely*). This questionnaire is a French adaptation of the EAT of Garner and Garfinkel (1979) and comprises 26 items divided into three factors: dieting (13 items; e.g., *Am terrified about being overweight*), control (seven items; e.g., *Avoid eating when I am hungry*), and bulimia (six items; e.g., *Vomit after I have eaten*). These three factors were the three target behaviors of this study and their Cronbach's alphas were marginally acceptable for male bodybuilders and runners (i.e., dieting [$\alpha_{bodybuilders}$ = .69; $\alpha_{runners}$ = .62], control [$\alpha_{bodybuilders}$ = .65; $\alpha_{runners}$ = .64], and bulimia [$\alpha_{bodybuilders}$ = .63; $\alpha_{runners}$ = .63]; Briggs-Gowan & Carter, 1998).

Data analysis

Path analyses were performed according to nine factors: AM, CM, attitude, subjective norm, perceived behavioral control, intention to gain muscle mass/to lean body mass, and eating disorders (i.e., dieting, control, and bulimia behaviors). To define the scale of the factors and ensure that the model was properly identified, one indicator for each factor was arbitrarily set to the value of one. All the latent factors were freely correlated as is the norm in path analysis. Nonsignificant links were removed (MacCallum, 1986). The final model selected was examined with relative fit indices as recommended by Hu and Bentler (1999). This is done because the goodness-of-fit chi-square that compares the hypothesized model with the independent or "totally free" model is almost always significant, even for well-fitting models, making it an inadequate basis for model evaluation. Therefore, CFI, TLI, and RMSEA were used to evaluate model fit because simulation studies have shown that these fit indices provide relatively consistent and stable assessments of model fit (Fan, Thompson, & Wang, 1999). A cutoff value of .90 or above for TLI and CFI is typically considered an acceptable criterion for model fit, although a value greater than .95 is preferable (Hu & Bentler, 1999). A critical value of .08 or below for RMSEA is considered satisfactory for good fit (Hu & Bentler, 1999). The model was rejected if the probability value (p) was below .05 (Arbuckle & Wothke, 2011).

The direct, indirect, and total effects for the structural model (i.e., comprising the direct paths and all indirect paths) were calculated (Byrne, 2005). Methods of multiple mediation were employed, and the different effects and their corresponding 95% confidence intervals (95% CIs) were calculated to estimate both total and indirect effects for multiple mediator models using bootstrapping and providing bias-corrected 95% CIs. The number of bootstrap draws specified was 10,000 as recommended by Hayes (2012). Concerning the mediations, the 95% CI is assumed to indicate significant indirect effects if it does not include zero (Preacher & Hayes, 2004).

Results

The overall descriptive statistics of the variables for male bodybuilders and runners are presented in Tables 1 and 2, respectively. According to Garner and Garfinkel (1979), 31.25% of the bodybuilders and 19.27% of the runners presented an EAT score higher than 20, suggesting that they may have had an eating disorder.

To test the hypothesized relations between the variables in the male bodybuilders and runners, path analyses were used. The final model demonstrated a very satisfactory fit index for bodybuilders, χ^2 (19) = 23.18, p = .229, TLI = .99, CFI = .99, RMSEA = .02 and runners, χ^2 (17) = 22.48, p = .167, TLI = .98, CFI = .99, RMSEA = .03. The structural path coefficients are shown in Figures 2 and 3, respectively.

For the male bodybuilders (Figure 2), CM was significantly, directly, and positively related to eating disorders (dieting, control, and bulimia behaviors) (respectively, $\beta = 0.34$, $p < .001$; $\beta = 0.27$, $p < .001$; $\beta = 0.32$, $p < .001$). The AM was significantly, indirectly, and positively related to eating disorders via perceived behavioral control ($\beta = 0.37$, $p < .001$) and intention to gain muscle mass ($\beta = 0.15$, $p < .001$), whereas CM was significantly, indirectly, and positively related to these behaviors via attitude ($\beta = 0.41$, $p < .001$) and intention to gain

Table 1 Descriptive Statistics, Reliability Coefficients, and Pearson Correlations Among Male Bodybuilders (N = 272)

Variables	Mean (*SD*)	1	2	3	4	5	6	7	8	9
1. Autonomous motivation for sport	6.24 (0.64)		.20**	.42**	.04	.22**	.32**	.17**	.11	.15*
2. Controlled motivation for sport	2.27 (0.78)			.08	.41**	.27**	.26**	.38**	.33**	.39**
3. Attitude	3.91 (1.45)				.26**	.31**	.59**	.13**	.13*	.10
4. Subjective norm	3.39 (1.05)					.34**	.55**	.22**	.23**	.22**
5. Perceived behavioral control	5.96 (1.08)						.38**	.26**	.21**	.22**
6. Intention	3.86 (1.22)							.33**	.30**	.26**
7. Dieting	2.89 (0.86)								.67**	.73**
8. Control	2.86 (1.08)									.78**
9. Bulimia	2.30 (0.90)									

*$p < .05$. **$p < .01$.

Table 2 Descriptive Statistics, Reliability Coefficients, and Pearson Correlations Among Male Runners ($N = 217$)

Variables	Mean (*SD*)	1	2	3	4	5	6	7	8	9
1. Autonomous motivation for sport	6.20 (0.63)		.14*	.07	.09	.38**	.31**	.24**	.04	.19**
2. Controlled motivation for sport	2.35 (0.93)			.26**	.25**	.07	.22**	.46**	.36**	.41**
3. Attitude	3.22 (1.57)				.61**	.36**	.52**	.41**	.28**	.30**
4. Subjective norm	2.58 (1.40)					.49**	.64**	.43**	.27**	.34**
5. Perceived behavioral control	5.18 (1.36)						.56**	.26**	.13**	.20**
6. Intention	4.42 (1.56)							.38**	.19**	.36**
7. Dieting	2.60 (0.70)								.66**	.71**
8. Control	2.55 (0.90)									.58**
9. Bulimia	2.01 (0.80)									

*$p < .05$. **$p < .01$.

muscle mass ($\beta = 0.44$, $p < .001$). The model explained 16.0%, 14.0%, and 19.0% of the variance of dieting, control, and bulimia behaviors, respectively.

To further examine the mediating role of the sociocognitive variables of the TPB in the relationships between motivations for sport and eating disorders, multiple mediation analyses were performed following the recommendations of Hayes (2012) (Table 3). They showed that AM was significantly, indirectly, and positively related only to bulimia behavior via perceived behavioral control and intention to gain muscle mass ($\beta = 0.19$, $p < .05$). The regression scores of the indirect relations between CM and eating disorders ($\beta_{dieting} = 0.41$, $p < .001$; $\beta_{control} = 0.44$, $p < .001$; $\beta_{bulimia}$=0.43, $p < .001$) were stronger than the regression scores of the direct relations ($\beta_{dieting} = 0.37$, $p < .001$; $\beta_{control} = 0.37$, $p < .001$; $\beta_{bulimia}$=0.39, $p < .001$).

For the male runners (Figure 3), CM was significantly, directly, and positively related to dieting, control, and bulimia behaviors (respectively, $\beta = 0.39$, $p < .001$; $\beta = 0.37$, $p < .001$; $\beta = 0.36$, $p < .001$). The AM was significantly, indirectly, and positively related to dieting and control behaviors via perceived behavioral control ($\beta = 0.32$, $p < .001$) and intention to lean body mass ($\beta = 0.21$, $p < .001$), whereas CM was significantly, indirectly, and positively related to these behaviors via

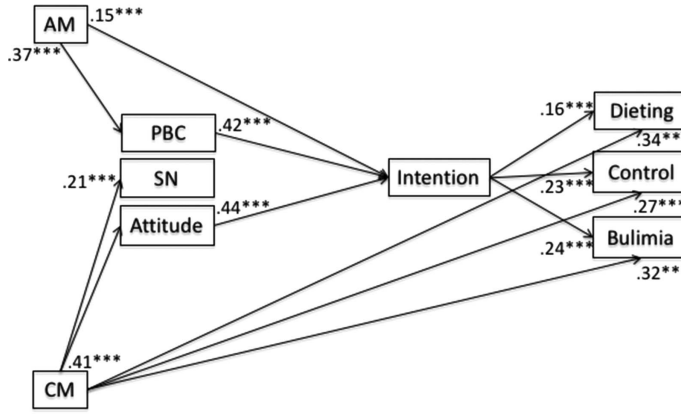

Figure 2 — Final path analysis of the TCM applied to eating behaviors among male bodybuilders. AM = autonomous motivation for sport; CM = controlled motivation for sport; PBC = perceived behavioral control related to gain muscle mass; SN = subjective norm related to gain muscle mass; attitude = attitude to gain muscle mass; intention = intention to gain muscle mass; TCM = trans-contextual model of motivation. ***$p < .001$.

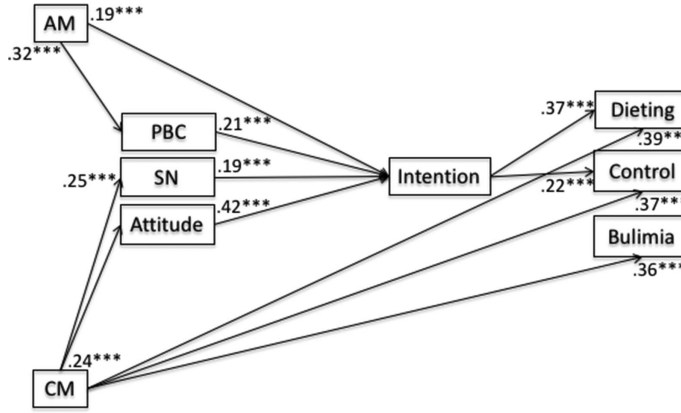

Figure 3 — Final path analysis of the TCM applied to eating behaviors among male runners. AM = autonomous motivation for sport; CM = controlled motivation for sport; PBC = perceived behavioral control related to lean body mass; SN = subjective norm related to lean body mass; attitude = attitude to lean body mass; intention = intention to lean body mass; TCM = trans-contextual model of motivation. ***$p < .001$.

subjective norm ($\beta = 0.25$, $p < .001$), attitude ($\beta = 0.24$, $p < .001$), and intention to lean body mass ($\beta_{SN\text{-}Intention} = 0.19$, $p < .001$; $\beta_{Attitude\text{–}Intention} = 0.42$, $p < .001$). The model explained 24.0%, 21.0%, and 13.0% of the variance of dieting, control, and bulimia behaviors, respectively.

Table 3 Summary of Multiple Mediation Analyses for the Final Structural Model Among Bodybuilders

Independent variable	First mediator variable	Second mediator variable	Dependent variable	*a* path coef	*b* path coef	*c* path coef	*c'* path coef	*d* path coef	Mean indirect effect	*SE* of mean	Bias-corrected 95% CI mean effect
AM	PBC	INT	Dieting	0.59***	0.16***	0.13	0.06	0.81***	0.08	0.02	[0.04, 0.13]
AM	PBC	INT	Control	0.59***	0.23***	0.11	0.00	0.81***	0.11	0.03	[0.06, 0.18]
AM	PBC	INT	Bulimia	0.59***	0.20***	0.19*	0.10	0.81***	0.10	0.03	[0.05, 0.16]
CM	Att	INT	Dieting	0.74***	0.09**	0.41***	0.37***	0.59***	0.04	0.02	[0.01, 0.08]
CM	Att	INT	Control	0.74***	0.15**	0.44***	0.37***	0.59***	0.07	0.02	[0.03, 0.12]
CM	Att	INT	Bulimia	0.74***	0.15***	0.43***	0.39***	59***	0.07	0.02	[0.03, 0.11]

Note. 95% CI = lower and upper bound of bias-corrected 95% confidence interval with 10,000 bootstrap samples; AM = autonomous motivation for sport; CM = controlled motivation for sport; PBC = perceived behavioral control related to gain muscle mass; Att = attitude to gain muscle mass; INT = intention to gain muscle mass; *a* = direct effect of the independent variable on the first mediator variable; *b* = direct effect of the second mediator variable on the dependent variable; *c* = indirect effect of the independent variable on the dependent variable through mediator variables; *c'* = direct effect of the independent variable on the dependent variable; *d* = direct effect of the first mediator variable on the second variable.

*$p < .05$. **$p < .01$. ***$p < .001$.

To further examine the mediating role of the sociocognitive variables of the TPB in the relationships between motivations for sport and eating disorders, multiple mediation analyses were performed following the recommendations of Hayes (2012) (Table 4). The regression scores of the indirect relationships between CM and dieting behavior via subjective norm and intention to lean body mass ($\beta_{indirect} = 0.33$, $p < .001$; $\beta_{direct} = 0.26$, $p < .001$) and via attitude and intention to lean body mass ($\beta_{indirect} = 0.33$, $p < .001$; $\beta_{direct} = 0.27$, $p < .001$) were stronger than the regression scores of the direct relationships. In the same configuration, the regression scores of the indirect relationships between CM and control behavior via subjective norm and intention to lean body mass ($\beta_{indirect} = 0.39$, $p < .001$; $\beta_{direct} = 0.32$, $p < .001$) and via attitude and intention to lean body mass ($\beta_{indirect} = 0.39$, $p < .001$; $\beta_{direct} = 0.32$, $p < .001$) were stronger than the regression scores of the direct relationships.

Discussion

The aim of the present study was to apply the key propositions and hypotheses of the TCM (e.g., Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003) to eating disorders (i.e., dieting, control, and bulimia behaviors) in male bodybuilders and runners. The results only partially supported the tenets of the TCM, thus enriching the theoretical understanding of how motivational sequences operate in this model applied to specific behaviors in sport. We hypothesized that motivations for sport would affect eating disorders in these bodybuilders and runners both directly and via the mediation of the sociocognitive variables from the TPB (i.e., attitude, subjective norm, perceived behavioral control related to gaining muscle mass in male bodybuilders and to leaning body mass in male runners).

The results showed that Hypothesis 1 was partially validated. The CM was expected to be positively related to eating disorders both directly and indirectly via the sociocognitive variables from the TPB in both samples. Analysis indicated that the higher the athletes scored on CM, the more they were at a direct risk of an eating disorder. This result is in accordance with previous studies about drive for muscularity behaviors (Chaba et al., 2019), doping intention (Chan et al., 2015), unhealthy eating behaviors (e.g., Murray et al., 2018), and eating disorders (e.g., Thaler et al., 2016). Moreover, CM was indirectly related to specific eating disorders. The higher the athletes scored on CM, the more they were at an indirect risk of an eating disorder like dieting and control behaviors because they perceived the benefits of gaining muscle mass/leaning body mass and had the intention to gain muscle mass/lean body mass. These findings are similar to those of studies on drive for muscularity behaviors (Chaba et al., 2019), physical activity and physical education (e.g., González-Martí et al., 2014), education settings (e.g., Hagger & Chatzisarantis, 2016), and healthy eating behaviors (e.g., Girelli et al., 2016).

In accordance with Hypothesis 1, the higher the bodybuilders scored on CM, the more they were at risk of bulimia behavior because they perceived the benefits of gaining muscle mass and had the intention to gain muscle mass. This result is linked to previous studies showing that men who exercised with external motivation wanted to gain muscle mass and were at risk of developing eating disorders (e.g., Dakanalis et al., 2015) and muscle dysmorphia (e.g., Longobardi, Prino, Fabris, & Settanni, 2017). Moreover, the higher the runners scored on CM, the

Table 4 Summary of Multiple Mediation Analyses for the Final Structural Model Among Runners

Independent variable	First mediator variable	Second mediator variable	Dependent variable	*a* path coef	*b* path coef	*c* path coef	*c'* path coef	*d* path coef	Mean indirect effect	*SE* of mean	Bias-corrected 95% CI mean effect
AM	PBC	INT	Dieting	0.73***	0.15***	0.20**	0.08	0.59***	0.06	0.02	[0.03, 0.11]
AM	PBC	INT	Control	0.73***	0.20***	0.22*	0.09	0.59***	0.09	0.03	[0.04, 0.15]
CM	SN	INT	Dieting	0.38***	0.08**	0.33***	0.26***	0.56***	0.02	0.01	[0.00, 0.04]
CM	SN	INT	Control	0.38***	0.13***	0.39***	0.32***	0.56***	0.03	0.01	[0.01, 0.06]
CM	Att	INT	Dieting	0.42***	0.06*	0.33***	0.27***	0.63***	0.02	0.01	[0.00, 0.04]
CM	Att	INT	Control	0.42***	0.11**	0.39***	0.32***	0.63***	0.02	0.02	[0.00, 0.07]

Note. 95% CI = lower and upper bound of bias-corrected 95% confidence interval with 10,000 bootstrap samples. AM = autonomous motivation for sport; CM = controlled motivation for sport; PBC = perceived behavioral control related to lean body mass; SN = subjective norm related to lean body mass; Att = attitude to lean body mass; INT = intention to lean body mass; *a* = direct effect of the independent variable on the first mediator variable; *b* = direct effect of the second mediator variable on the dependent variable; *c* = indirect effect of the independent variable on the dependent variable through mediator variables; *c'* = direct effect of the independent variable on the dependent variable; *d* = direct effect of the first mediator variable on the second variable.
*$p < .05$. **$p < .01$. ***$p < .001$.

more they perceived peer judgments about achieving a lean body mass and had the intention to lean their body mass, thus being more likely to engage in dieting and control behaviors. This result is in line with previous studies (e.g., Chan et al., 2015) showing that athletes have positive attitudes toward endurance training if they desire to become an athlete or a sports idol (e.g., Piech et al., 2016) and that male runners start diets and control their eating behaviors to achieve their goals (e.g., Sudi et al., 2004).

The second hypothesis was validated. The direct relationship between CM and eating disorders (dieting, control, and bulimia behaviors) was expected to be stronger than the direct relationship between AM and eating disorders. Indeed, CM was significantly, directly, and positively related to eating disorders in the male bodybuilders and to dieting and control behaviors in the male runners, whereas the direct relationships between AM and eating disorders were nonsignificant for both samples. These results are consistent with previous results showing that CM is a risk factor for eating disorders (e.g., Thaler et al., 2016).

Moreover, the strongest direct relationships of CM were with bulimia and control behaviors, respectively, in the male bodybuilders and runners. These results were in line with the literature showing that bodybuilders frequently show bulimic behaviors (e.g., Murray et al., 2018) and that runners control their eating to become leaner (e.g., Murray et al., 2012). The results indicated that both AM and CM positively contributed to eating disorders via some of the sociocognitive variables of the TPB, suggesting that a complex motivational sequence underlies the psychosocial factors related to eating disorders in male athletes desiring to gain muscle mass/lean body mass according to a reflective process and active self-regulation (e.g., Hall & Fong, 2010). In line with previous work (e.g., Chan et al., 2015), CM was also directly related, without mediation, seeming to indicate a higher risk of engaging in deviant behaviors, such as eating behaviors (e.g., Sheldon & Kasser, 1995).

The indirect relationships between motivations for sport and eating disorders were expected to be stronger than the direct relationships, according to Hypothesis 3, and this was validated. In accordance with previous research (e.g., Hagger & Chatzisarantis, 2016), the results provided evidence that the indirect relationships between motivations for sport and eating disorders were stronger than the direct ones. In fact, AM was nonsignificantly directly related to eating disorders in both samples, whereas it was significantly indirectly related to specific eating disorders. Moreover, the direct effect of CM on eating disorders was small compared with the indirect effect via the sociocognitive variables of the TPB in both samples.

Some results were invariant, whereas others were specific and surprising. For example, Hypothesis 1 was partially rejected for many reasons. The AM was expected to be negatively, directly, and indirectly related to eating disorders (i.e., dieting, control, and bulimia behaviors) in both samples. However, our findings indicated that AM was nonsignificantly related to eating disorders by the direct path in the male bodybuilders and runners. This is an original result given that AM is an indirect risk factor for eating disorders in these populations.

Analysis indicated that the more self-determined these male athletes were, the more they perceived that they could control their behaviors related to gaining muscle mass/leaning body mass and had the intention to gain muscle mass/lean body mass with the male bodybuilders displaying bulimia behavior and the male runners engaging in dieting and control behaviors. These results were in

accordance with previous studies related to drive for muscularity behaviors (Chaba et al., 2019) and healthy eating behaviors (e.g., Girelli et al., 2016). This result is interesting because when these male athletes were self-determined, the same sociocognitive variables of the TPB were implicated in the development of eating disorders, although the eating disorders were different.

Moreover, CM was nonsignificantly related to perceived behavioral control to gain muscle mass/lean body mass in the male bodybuilders and runners, respectively, which also refutes Hypothesis 1. This might be explained by the observation that extrinsic regulation of motivation and perceived behavioral control are theoretically opposing constructs; control is associated with more positive outcomes, including greater intrinsic motivation (Deci & Ryan, 2000). Also, CM was nonsignificantly linked to subjective norm about gaining muscle mass in the bodybuilders, which is understandable as bodybuilders are generally focused on themselves and are not interested in the opinions of their peers (e.g., Jankowski, Gough, Fawkner, Halliwell, & Diedrichs 2018).

Our study corroborates the research showing that the SDT and the TPB are complementary and can be integrated to better understand various behaviors (e.g., Chaba et al., 2019; Chan et al., 2015; Girelli et al., 2016; Hagger & Chatzisarantis, 2009, 2016). The major contribution of this study is that the TCM offered more complete explanations than either the SDT or the TPB alone regarding social behaviors in eating behavior contexts for two samples of male athletes desiring to either gain muscle mass or lean body mass. However, the results differed somewhat from the pattern of effects found in previous tests of the TCM in other contexts (e.g., Chan et al., 2015), specifically regarding the paradoxical role of AM as related to eating behaviors.

Limitations and Perspectives

Although this study has several strengths, some limitations should be acknowledged. First, our sample was composed of young men with different numbers of years of practice, hours of practice per week, and types of practices (i.e., noncompetitors, future competitors, competitors), which might have influenced their motivation and engagement (e.g., Chaba, d'Arripe-Longueville, Scoffier-Mériaux, & Lentillon-Kaestner, 2018). A solution for the future might be to include the level of competition in the analyses. Second, the runners were older than the bodybuilders, and younger people are more at risk of developing eating disorders than older people (e.g., Longobardi et al., 2017). It would be interesting to have samples with approximately the same age. Third, the data were collected using a self-report survey and might have been influenced by social desirability. The model would be deepened by including implicit attitude measures of eating behaviors. Fourth, no model/theory on body image in men was used in this study, although body dissatisfaction was clearly present (e.g., Murray et al, 2010; Murray et al., 2012), and drive for muscularity was not considered.

Moreover, although applying the TCM to male athletes was fruitful, another model that also takes into account sociocognitive variables, such as the Health Action Process Approach (Schwarzer, 1992), might be applied in future research. Future studies could also specifically measure body satisfaction and analyze the

link between this variable, behaviors to gain muscle mass/lean body mass, and the development of eating disorders. Fifth, our study was correlational and had the typical limitations of this type of design; it would be interesting to conduct a longitudinal study to more closely examine causality in the relationships.

Sixth, it would be useful to determine a cutoff for eating disorders in male athletes because the EAT is not adapted to measure eating disorders in male athletes desiring to gain muscle mass. This would enable researchers to distinguish male athletes with and without eating disorders to compare the models between these two subsamples and determine whether positive relationships between AM and eating disorders are present only in healthy male athletes. Finally, the motivational mechanisms explaining the development of eating disorders in male bodybuilders and runners who desire to gain muscle mass/lean body mass need to be further investigated in terms of motivational profiles (e.g., Gillet, Berjot, & Paty, 2010; Martinent & Decret, 2015). According to Deci and Ryan (1985), an intraindividual approach would be more useful than an interindividual approach because the intraindividual approach establishes a motivational profile by regrouping different forms of motivation into a single variable reflecting the individual's level of self-determined motivation and its relationships to eating behaviors or disorders.

Clinical Implications

The results of our study provide a better understanding of the motivational sequence underlying eating disorders in two male sports. These results suggest several practical avenues for intervention to prevent eating disorders. First, it appears necessary to limit the deleterious effects of CM. This might be accomplished by identifying the motivational orientations of athletes and promoting the development of coaching styles and climates that support autonomy and basic needs. Given the paradoxical role of AM observed in the present study, it also appears necessary to encourage athletes to build reasoned and healthy sports practices, limiting muscle mass gain at all costs.

Conclusion

Despite some limitations, this study pointed to some important relationships embedded in the theoretically integrated model of the SDT and the TPB. It showed that even though male bodybuilders and runners pursue opposite physical goals, they display similarities in the motivational sequence influencing their eating disorders. These results indicated that the TCM was partially supported in the context of eating disorders in these two populations. Both types of motivations for sport were direct or indirect risk factors for the development of deviant behaviors, but CM seemed to indicate greater risk than autonomous motivation for the development of eating disorders.

References

Ajzen, I., & Madden, T.J. (1986). Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control. *Journal of Experimental Social Psychology, 22*(5), 453–474. doi:10.1016/0022-1031(86)90045-4

American Psychiatric Association. (2013). *DSM-5: Diagnostic and statistical manual of mental disorders*. Arlington, VA: American Psychiatric Pub.

Arbuckle, J., & Wothke, W. (2011). *Amos 20 user's guide*. Chicago, IL: SPSS/Amos Development Corp.

Ashley, C.D., Smith, J.F., Robinson, J.B., & Richardson, M.T. (1996). Disordered eating in female collegiate athletes and collegiate females in an advanced program of study: A preliminary investigation. *International Journal of Sport Nutrition and Exercise Metabolism, 6*(4), 391–401. doi:10.1123/ijsn.6.4.391

Briggs-Gowan, M.J., & Carter, A.S. (1998). Preliminary acceptability and psychometrics of the infant–toddler social and emotional assessment (ITSEA): A new adult-report questionnaire. *Infant Mental Health Journal: Official Publication of The World Association for Infant Mental Health, 19*(4), 422–445.

Byrne, B.M. (2005). Factor analytic models: Viewing the structure of an assessment instrument from three perspectives. *Journal of Personality Assessment, 85*(1), 17–32. PubMed ID: 16083381 doi:10.1207/s15327752jpa8501_02

Çarpar, M., & Şavran, T. (2019). Body, culture and masculinity: A sociological study on the preservation of body building as a masculine field. *Spor Bilimleri Arastirmalari Dergisi, 4*(2), 264–288.

Chaba, L., d'Arripe-Longueville, F., Lentillon-Kaestner, V., & Scoffier-Mériaux, S. (2019). Drive for muscularity behaviors in male bodybuilders: A trans-contextual model of motivation. *Journal of Eating Disorders, 7*(1), 1–11. doi:10.1186/s40337-019-0274-y

Chaba, L., d'Arripe-Longueville, F., Scoffier-Mériaux, S., & Lentillon-Kaestner, V. (2018). Investigation of eating and deviant behaviors in bodybuilders according to their competitive engagement. *Deviant Behavior, 40*(6), 655–671. doi:10.1080/01639625.2018.1437652

Chan, D.K.C., Dimmock, J.A., Donovan, R., Hardcastle, S., Lentillon-Kaestner, V., & Hagger, M. (2015). Self-determined motivation in sport predicts anti-doping motivation and intention: A perspective from the trans-contextual model. *Journal of Science and Medicine in Sport, 18*(3), 315–322. PubMed ID: 24793786 doi:10.1016/j.jsams.2014.04.001

Chapman, J., & Woodman, T. (2016). Disordered eating in male athletes: A meta-analysis. *Journal of Sports Sciences, 34*(2), 101–109. PubMed ID: 25916949 doi:10.1080/02640414.2015.1040824

Courneya, K.S. (1995). Understanding readiness for regular physical activity in older individuals: An application of the theory of planned behavior. *Health Psychology, 14*(1), 80–87. PubMed ID: 7737078 doi:10.1037/0278-6133.14.1.80

Dakanalis, A., Favagrossa, L., Clerici, M., Prunas, A., Colmegna, F., Zanetti, M.A., & Riva, G. (2015). Body dissatisfaction and eating disorder symptomatology: A latent structural equation modeling analysis of moderating variables in 18-to-28-year-old males. *The Journal of Psychology, 149*(1), 85–112. doi:10.1080/00223980.2013.842141

Davis, C., & Scott-Robertson, L. (2000). A psychological comparison of females with anorexia nervosa and competitive male bodybuilders: Body shape ideals in the extreme. *Eating Behaviors, 1*(1), 33–46. PubMed ID: 15001065 doi:10.1016/S1471-0153(00)00007-6

de Oliveira, G.L., de Oliveira, T.A.P., de Pinho Gonçalves, P.S., Valentim Silva, J.R., Roquetti Fernandes, P., & Fernandes Filho, J. (2017). Body image and eating disorders in female athletes of different sports. *Journal of Exercise Physiology Online, 20*(2) 45–54.

Deci, E.L., & Ryan, R.M. (1985). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality, 19*(2), 109–134. doi:10.1016/0092-6566(85)90023-6

Deci, E.L., & Ryan, R.M. (2000). The "What" and "Why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268. doi:10.1207/S15327965PLI1104_01

Devrim, A., Bilgic, P., & Hongu, N. (2018). Is there any relationship between body image perception, eating disorders, and muscle dysmorphic disorders in male bodybuilders? *American Journal of Men's Health, 12*(5), 1746–1758. PubMed ID: 30003837 doi:10.1177/1557988318786868

Dosil, J. (2008). *Eating disorders in athletes*. Chichester, England; Hoboken, NJ: John Wiley & Sons.

Elliot, A.J., McGregor, H.A., & Thrash, T.M. (2002). The need for competence. In E. L. Deci & R. M. Ryan (Eds.) *Handbook of self-determination research* (pp. 361–388). New York, NY: University Rochester Press.

Fabris, M.A., Longobardi, C., Prino, L.E., & Settanni, M. (2018). Attachment style and risk of muscle dysmorphia in a sample of male bodybuilders. *Psychology of Men & Masculinity, 19*(2), 273–281. doi:10.1037/men0000096

Fan, X., Thompson, B., & Wang, L. (1999). Effects of sample size, estimation methods, and model specification on structural equation modeling fit indexes. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 56–83. doi:10.1080/10705519909540119

Garner, D.M., & Garfinkel, P.E. (1979). The Eating Attitudes Test: An index of the symptoms of anorexia nervosa. *Psychological Medicine, 9*(2), 273–279. PubMed ID: 472072 doi:10.1017/S0033291700030762

Gillet, N., Berjot, S., & Paty, E. (2010). Profils motivationnels et ajustement au travail: vers une approche intra-individuelle de la motivation. *Le travail humain, 73*(2), 141–162. doi:10.3917/th.732.0141

Girelli, L., Hagger, M., Mallia, L., & Lucidi, F. (2016). From perceived autonomy support to intentional behaviour: Testing an integrated model in three healthy-eating behaviours. *Appetite, 96,* 280–292. PubMed ID: 26423363 doi:10.1016/j.appet.2015.09.027

Goldfield, G.S. (2009). Body image, disordered eating and anabolic steroid use in female bodybuilders. *Eating Disorders, 17*(3), 200–210. PubMed ID: 19391019 doi:10.1080/10640260902848485

González-Martí, I., Bustos, J.G.F., Hernández-Martínez, A., & Jordán, O.R.C. (2014). Physical perceptions and self-concept in athletes with muscle dysmorphia symptoms. *The Spanish Journal of Psychology, 17,* 1–7.

Hagger, M.S., & Chatzisarantis, N.L. (2009). Integrating the theory of planned behaviour and self-determination theory in health behaviour: A meta-analysis. *British Journal of Health Psychology, 14*(2), 275–302. doi:10.1348/135910708X373959

Hagger, M.S., & Chatzisarantis, N.L. (2016). The trans-contextual model of autonomous motivation in education: Conceptual and empirical issues and meta-analysis. *Review of Educational Research, 86*(2), 360–407. PubMed ID: 27274585 doi:10.3102/0034654315585005

Hagger, M.S., Chatzisarantis, N.L., Culverhouse, T., & Biddle, S.J. (2003). The processes by which perceived autonomy support in physical education promotes leisure-time physical activity intentions and behavior: A trans-contextual model. *Journal of Educational Psychology, 95*(4), 784–795. doi:10.1037/0022-0663.95.4.784

Hall, P.A., & Fong, G.T. (2010). Temporal self-regulation theory: Looking forward. *Health Psychology Review, 4*(2), 83–92. doi:10.1080/17437199.2010.487180

Harris, J., & Peterson, J.T. (2020). Eating disorders in male runners. *Strength & Conditioning Journal, 42*(1), 53–59. doi:10.1519/SSC.0000000000000509

Hayes, A.F. (2012). PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling [White paper]. Retrieved from http://www.afhayes.com/ public/process2012.pdf

Hu, L.T., & Bentler, P.M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55. doi:10.1080/10705519909540118

Jankowski, G.S., Gough, B., Fawkner, H., Halliwell, E., & Diedrichs, P.C. (2018). Young men's minimisation of their body dissatisfaction. *Psychology & Health, 33*(11), 1343–1363. PubMed ID: 30334461 doi:10.1080/08870446.2018.1496251

Kinnunen, T., & Vallet, G. (2018). Vertu et vice de la combinaison du contrôle et du désir. Le body-building et le capitalisme post-industriel. *Staps, 119*(1), 81–94. doi:10.3917/sta.119.0081

Leichner, P., Steiger, H., Puentes-Neuman, G., Perreault, M., & Gottheil, N. (1994). Validation of an eating attitude scale in a French-Speaking Quebec population. *Canadian Journal of Psychiatry. Revue canadienne de psychiatrie, 39*(1), 49–54. PubMed ID: 8193998 doi:10.1177/070674379403900110

Leong, S.L., Madden, C., Gray, A., & Horwath, C. (2012). Self-determined, autonomous regulation of eating behavior is related to lower body mass index in a nationwide survey of middle-aged women. *Journal of the Academy of Nutrition and Dietetics, 112*(9), 1337–1346. PubMed ID: 22939438 doi:10.1016/j.jand.2012.04.018

Longobardi, C., Prino, L.E., Fabris, M.A., & Settanni, M. (2017). Muscle dysmorphia and psychopathology: Findings from an Italian sample of male bodybuilders. *Psychiatry Research, 256,* 231–236. PubMed ID: 28646788 doi:10.1016/j.psychres.2017.06.065

MacCallum, R. (1986). Specification searches in covariance structure modeling. *Psychological Bulletin, 100*(1), 107–120. doi:10.1037/0033-2909.100.1.107

Mangweth, B., Pope Jr, H., Kemmler, G., Ebenbichler, C., Hausmann, A., De Col, C., … Biebl, W. (2001). Body image and psychopathology in male bodybuilders. *Psychotherapy and Psychosomatics, 70*(1), 38–43. PubMed ID: 11150937 doi:10.1159/000056223

Markland, D., & Tobin, V. (2004). A modification to the behavioural regulation in exercise questionnaire to include an assessment of amotivation. *Journal of Sport and Exercise Psychology, 26*(2), 191–196. doi:10.1123/jsep.26.2.191

Murray, S.B., Pila, E., Mond, J.M., Mitchison, D., Blashill, A.J., Sabiston, C.M., & Griffiths, S. (2018). Cheat meals: A benign or ominous variant of binge eating behavior? *Appetite, 130,* 274–278. PubMed ID: 30144490 doi:10.1016/j.appet.2018.08.026

Martinent, G., & Decret, J.-C. (2015). Motivational profiles among young table-tennis players in intensive training settings: A latent profile transition analysis. *Journal of Applied Sport Psychology, 27*(3), 268–287. doi:10.1080/10413200.2014.993485

Murray, S.B., Rieger, E., Hildebrandt, T., Karlov, L., Russell, J., Boon, E., … Touyz, S.W. (2012). A comparison of eating, exercise, shape, and weight related symptomatology in males with muscle dysmorphia and anorexia nervosa. *Body Image, 9*(2), 193–200. PubMed ID: 22391410 doi:10.1016/j.bodyim.2012.01.008

Murray, S.B., Rieger, E., Touyz, S.W., & De la Garza García, L. (2010). Muscle dysmorphia and the DSM-V conundrum: Where does it belong? A review paper. *International Journal of Eating Disorders, 43*(6), 483–491. doi:10.1002/eat.20828

Nieuwoudt, J.E., Zhou, S., Coutts, R.A., & Booker, R. (2015). Symptoms of muscle dysmorphia, body dysmorphic disorder, and eating disorders in a nonclinical population of adult male weightlifters in Australia. *The Journal of Strength & Conditioning Research, 29*(5), 1406–1414. PubMed ID: 25909960 doi:10.1519/JSC.0000000000000763

Olivardia, R., Pope Jr, H.G., & Hudson, J.I. (2000). Muscle dysmorphia in male weightlifters: A case-control study. *American Journal of Psychiatry, 157*(8), 1291–1296. doi:10.1176/appi.ajp.157.8.1291

Palazón-Bru, A., Rizo-Baeza, M.M., Martínez-Segura, A., Folgado-De la Rosa, D.M., Gil-Guillén, V.F., & Cortés-Castell, E. (2018). Screening tool to determine risk of having muscle dysmorphia symptoms in men who engage in weight training at a gym. *Clinical Journal of Sport Medicine, 28*(2), 168–173. PubMed ID: 29271781 doi:10.1097/JSM.0000000000000422

Petrie, T.A., & Greenleaf, C.A. (2007). Eating disorders in sport: From theory to research to intervention. In G. Tenenbaum & R.C. Eklund (Eds.), *Handbook of sport psychology* (p. 352–378). Hoboken, NJ: John Wiley.

Piech, K., Carlson, R., Grants, J., Cherenkov, D., Gatatulin, A., Smaliakou, D., & Lindberg, U. (2016). Family influence on sport activity patterns during early adolescence: A comparative approach. *LASE Journal of Sport Science, 7*(2), 3–15.

Plateau, C.R., Arcelus, J., Leung, N., & Meyer, C. (2017). Female athlete experiences of seeking and receiving treatment for an eating disorder. *Eating Disorders, 25*(3), 273–277. PubMed ID: 28051927 doi:10.1080/10640266.2016.1269551

Pope, H.G., Gruber, A.J., Choi, P., Olivardia, R., & Phillips, K.A. (1997). Muscle dysmorphia: An underrecognized form of body dysmorphic disorder. *Psychosomatics, 38*(6), 548–557. PubMed ID: 9427852 doi:10.1016/S0033-3182(97)71400-2

Pope, H.G., Katz, D.L., & Hudson, J.I. (1993). Anorexia nervosa and "reverse anorexia" among 108 male bodybuilders. *Comprehensive Psychiatry, 34*(6), 406–409. PubMed ID: 8131385 doi:10.1016/0010-440X(93)90066-D

Preacher, K.J., & Hayes, A.F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, & Computers, 36*(4), 717–731. PubMed ID: 15641418 doi:10.3758/BF03206553

Quinn, M.A., & Robinson, S. (2020). College athletes under pressure: Eating disorders among female track and field athletes. *The American Economist, 65*(2), 232–243. doi:10.1177/0569434520938709

Ryan, R.M., & Connell, J.P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology, 57*(5), 749–761. PubMed ID: 2810024 doi:10.1037/0022-3514.57.5.749

Schwarzer, R. (1992). Self-Efficacy in the adoption and maintenance of health behaviors: Theoretical approaches and new model. In R. Schwarzer (Ed.), Self-efficacy: Thought control of action (pp. 217–243). Washington: Hemisphere.

Sheldon, K.M., & Kasser, T. (1995). Coherence and congruence: Two aspects of personality integration. *Journal of Personality and Social Psychology, 68*(3), 531–543. PubMed ID: 7714728 doi:10.1037/0022-3514.68.3.531

Steele, I.H., Pope, H.G., & Kanayama, G. (2019). Competitive bodybuilding: Fitness, pathology, or both? *Harvard Review of Psychiatry, 27*(4), 233–240. PubMed ID: 31219882

Stempień, J.R. (2015). Ladies and gentlemen . . . On your marks, get set, go! About leisure time sport and the popularity of running among men and women. *Acta Universitatis Lodziensis. Folia Sociologica,* (55), 183–209.

Sudi, K., Öttl, K., Payerl, D., Baumgartl, P., Tauschmann, K., & Müller, W. (2004). Anorexia athletica. *Nutrition, 20*(7–8), 657–661. PubMed ID: 15212748 doi:10.1016/j.nut.2004.04.019

Sundgot-Borgen, J. (1993). Prevalence of eating disorders in elite female athletes. *International Journal of Sport Nutrition and Exercise Metabolism, 3*(1), 29–40. doi:10.1123/ijsn.3.1.29

Sundgot-Borgen, J. (1999). Eating disorders among male and female elite athletes. *British Journal of Sports Medicine, 33*(6), 434. PubMed ID: 10597857 doi:10.1136/bjsm.33.6.434

Thaler, L., Israel, M., Antunes, J.M., Sarin, S., Zuroff, D.C., & Steiger, H. (2016). An examination of the role of autonomous versus controlled motivation in predicting

inpatient treatment outcome for anorexia nervosa. *International Journal of Eating Disorders, 49*(6), 626–629. doi:10.1002/eat.22510

Tylka, T.L. (2011). Refinement of the tripartite influence model for men: Dual body image pathways to body change behaviors. *Body Image, 8*(3), 199–207. doi:10.1016/j.bodyim.2011.04.008

Vansteenkiste, M., Soenens, B., & Vandereycken, W. (2005). Motivation to change in eating disorder patients: A conceptual clarification on the basis of self-determination theory. *International Journal of Eating Disorders, 37*(3), 207–219. doi:10.1002/eat.20099

Verstuyf, J., Patrick, H., Vansteenkiste, M., & Teixeira, P.J. (2012). Motivational dynamics of eating regulation: A self-determination theory perspective. *International Journal of Behavioral Nutrition and Physical Activity, 9*(1), 21–16. doi:10.1186/1479-5868-9-21