

# Motives, Motivation and Exercise Behavioral Regulations in CrossFit and Resistance Training Participants

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**How to cite this paper:** Marin, D. P., Polito, L. F. T., Foschini, D., Urtado, C. B., & Otton, R. (2018). Motives, Motivation and Exercise Behavioral Regulations in CrossFit and Resistance Training Participants. *Psychology*, 9, 2869-2884.  
<https://doi.org/10.4236/psych.2018.914166>

**Received:** December 3, 2018

**Accepted:** December 18, 2018

**Published:** December 21, 2018

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## Abstract

The present study investigated the motivational factors, behavioral regulations based on self-determination theory framework, and the relationships between basic psychological need satisfaction and actual exercise behaviors of CrossFit and resistance training (RT) participants. A total of 493 subjects (males = 351, females = 148), RT (n = 365, 279 males, 86 females) and CrossFit (n = 128, 69 males, 59 females) completed an online questionnaire. Results indicated that CrossFit participants presented higher levels of enjoyment, stress management, social recognition, affiliation, competition, and weight management. Conversely, RT participants reported higher motive for appearance. Intrinsic motivation to exercise was significantly higher in CrossFit, whereas RT participants scored higher controlled motivation. There was no significant difference between weekly exercise volume between groups; therefore, correlation and mediation analysis were conducted with pooled data. Autonomy and competence were significantly associated with more autonomous forms of motivation. Exercise frequency and weekly exercise volume were positively related to intrinsic motivation. When examining the mediating model, competence and intrinsic motivation were found to mediate the relationship between enjoyment and weekly exercise volume. Our results support the relationship among psychological needs satisfaction, intrinsic motivation, and exercise behavior in CrossFit and RT participants. Exercise professionals can encourage individuals to seek self-determined and personally meaningful exercise benefits to promote long-term exercise adherence in fitness centers.

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## Keywords

Self-Determination Theory, Strength Training, Exercise Enjoyment, Exercise Participation

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## 1. Introduction

Resistance training (RT) is a well-documented exercise modality to improve several physiological and psychological health parameters (Fiuza-Luces, Garatachea, Berger, & Lucia, 2013). RT has been demonstrated to decrease visceral fat, glycated hemoglobin, low-density lipoprotein, and triglycerides, increasing glucose transporter type 4, increase muscle and bone mass. Also, benefits of RT also include improved physical performance, movement control, functional independence, cognitive abilities, body composition, body image, and self-esteem (Westcott, 2012). Despite several exercise-benefits, 40% to 65% of individuals initiating exercise programs are predicted to dropout within 3 to 6 months (Annesi, 1998, 2003). Concerning attendance and membership records in fitness centers, Sperandei et al. (2016) reported that dropout reached 47% already by the second month, 86% by the sixth month, and was nearly complete 96% by the twelfth month. It is possible that many individuals may be either unmotivated or not sufficiently motivated to participate in exercise programs regularly.

Self-determination theory (SDT) provides a useful theoretical foundation for the investigation of exercise-related motivations and behaviors, based on the fact that people are moved to act by different reasons, with highly varied experiences and consequences (Ryan & Deci, 2007). SDT points out a distinction between intrinsic motivation, which involves engaging in a behavior because of its inherent satisfactions (*i.e.*, for enjoyment, interest, and challenge). Extrinsic motivation, in contrast, suggests engagement in behavior for instrumental reasons, or to achieving a separate consequence from the activity per se (*i.e.*, gain a social reward, or avoid disapproval) (Ryan & Deci, 2007). The proponents of SDT present that extrinsically motivated behaviors are distributed through a continuum of self-determination, which is composed of four regulations progressively more internalized (autonomous) (Ryan & Deci, 2007): external regulation (behavior controlled by obtain external rewards or avoid punishments), introjected regulation (doing an activity to avoid internal pressure and self-esteem-related contingencies), identified regulation (recognition of the value of a behavior), integrated regulation (engagement in a behavior because it is consistent with the person's core values and beliefs). In the context of exercise, people more autonomously motivated are more likely to engage in regular exercise behavior (Edmunds et al., 2006). In their systematic review, Teixeira et al. (2012) demonstrated a consistent positive effect of autonomous regulation on exercise behavior. Furthermore, longitudinal research showed that when intervention emphasized enjoyment, mastery, and challenge rather than the outcomes of exercise,

intrinsic motivation was the better predictor of moderate and vigorous exercise (Silva et al., 2011).

Participation motives are the contents of individual's goals for a particular domain of behavior (Ingledeu, Markland, & Ferguson, 2009). Exercise motives are considered as essentially intrinsic (e.g., seeking affiliation, personal growth, enjoyment and health) as those viewed to be more nearly related to the satisfaction of BPN, or extrinsic (e.g., social recognition, appearance) those typically are not truly or universally essential to well-being and personal growth (Weman-Josefsson, Lindwall, & Ivarsson, 2015). In fact, intrinsic exercise-related motives are associated with higher exercise adherence (Ryan, Frederick, Leps, Rubio, & Sheldon, 1997), although no direct influence has already been documented (Teixeira et al., 2012).

The basic needs theory, a sub-theory of SDT, proposes that autonomous motivation arises from individual's innate tendency to satisfy three basic psychological needs (BPN): relatedness (the need to establish and sustain meaningful connections with others), autonomy (sense of ownership over the behavior) (Weman-Josefsson et al., 2015) and competence (need to master personally challenging activities as opposed to trivial or meaningless tasks) (Rodgers, Markland, Selzler, Murray, & Wilson, 2014). In SDT, "needs specify innate psychological nutrients that are essential for ongoing psychological growth, integrity, and well-being" (Deci & Ryan, 2000).

Recently, there has been growing interest in CrossFit literature regarding psychological and behavioral indicators. For example, exercise motives are dependent upon type or modality of exercise. Fisher et al. (2017) showed that CrossFit participants reported more intrinsic motives to exercise such as enjoyment, challenge, and affiliation, while traditional RT practitioners indicated more health-related motives such as ill-health avoidance and weight management. Such difference may also be found between male and female participants. Other investigation verified gender differences in the motivation between men and women CrossFit members. The authors found that men had higher levels of performance goals, while women reported more mastery-based goals (Partridge, Knapp, & Massengale, 2014). To the best of our knowledge, only one study using mediating analysis has focused on CrossFit participants to examine the relationship between SDT framework and exercise participation. Sibley and Bergman (2017) observed in 322 CrossFit members that intrinsic goals predicted psychological need satisfaction. Furthermore, participation frequency was positively predicted by intrinsic regulation, intrinsic goals content, and competence need satisfaction.

Considering the marked growth and popularity of CrossFit, we use the SDT framework to a better understanding of the motivational factors that drive individuals to participate in such exercise program. Identifying differences in individual's motivation is crucial to tailor appropriate strategies to facilitate exercise adherence. Therefore, the purpose of the present study was to investigate the motivational factors, behavioral regulations based on SDT, and the relationships

between basic psychological need satisfaction and actual exercise behaviors of CrossFit and traditional RT participants. We tested a model of mediation in which competence and intrinsic regulation could mediate the relationship between enjoyment and actual exercise behavior.

## 2. Material and Methods

### 2.1. Participants

A total of 493 participants (males = 351, females = 148) from Brazil completed the questionnaires, from two categories: traditional resistance training (RT;  $n = 365$ , 279 males, 86 females; age  $28.6 \pm 6.84$  years; body mass  $77.6 \pm 14.5$  kg; height  $173.3 \pm 9.09$  cm; IMC  $25.6 \pm 3.6$  kg/m<sup>2</sup>) and CrossFit ( $n = 128$ , 69 males, 59 females; age  $30.1 \pm 6.8$  years; body mass  $73.4 \pm 12.4$  kg; height  $170.7 \pm 9.02$  cm; IMC  $24.9 \pm 2.9$  kg/m<sup>2</sup>). Individuals were eligible to participate in the study if they were adult (18 - 50 years), and attended a gym, fitness center, or CrossFit box frequently. Local ethical committee approved the experimental procedures (72429517.8.0000.8084).

### 2.2. Procedures

A single online questionnaire was created through Google Forms and promoted on social media (Facebook page) of the authors with advertising text. The questionnaire link was open for approximately two months of 2017. All participants completed the questionnaire voluntarily and anonymously and did not receive any financial or another reward for their contribution. The average time of filling out the survey was 20 minutes. This research is characterized as a fieldwork and should be considered as a mostly descriptive cross-sectional study. The demographic portion of the survey comprised questions designed to elicit responses about participant's age, gender, marital status, and education levels.

### 2.3. Questionnaires

#### 2.3.1. Behavioral Regulations for Exercise

Behavioral regulations were assessed using the Behavioral Regulations in Exercise Questionnaire-3 based on SDT (BREQ-3) (Wilson, Rodgers, Loitz, & Scime, 2006). The BREQ-3 includes 23 items scored in a five-point scale ranging from 0 (not true for me) to 4 (very true for me) and contains six subscales that measure amotivation (e.g., "I don't see why I should have to exercise"), external (e.g., "I feel under pressure from my family/friends to exercise"), introjected (e.g., "I feel guilty when I don't exercise"), identified (e.g., "It's important to me to exercise regularly"), integrated (e.g., "I exercise because it is consistent with my life goals"), and intrinsic (e.g., "I enjoy my exercise sessions") regulation of exercise behavior. The BREQ-3 has been demonstrated a good factorial validity and was translated and validated for the Portuguese language (Guedes & Sofiati, 2015).

#### 2.3.2. Basic Psychological Needs in the Exercise Scale

The Portuguese version of the Basic Psychological Needs in Exercise Scale (BPNES)

is a self-report instrument developed specifically for the context of physical exercise by Vlachopoulos and Michailidou (2009), subsequently translated and validated for the Portuguese language (Moutão, Cid, Leitão, Alves, & Vlachopoulos, 2012); it is used to evaluate the perception that people have of the level of satisfaction of their basic psychological needs. The questionnaire was made up of 12 items grouped into three factors: autonomy (e.g. “the exercise program I follow at the facility is in keeping with my interests”), competence (e.g., “I have made great progress as far as a result pursued is concerned), and relatedness (e.g. “I feel very comfortable when I do exercise with other participants”). This questionnaire used a Likert-type scale ranging from 1 (*totally disagree*) to 5 (*totally agree*).

### 2.3.3. Perceived Autonomy Support Climate

The Portuguese version of the Perceived Autonomy Support: Exercise Climate Questionnaire (PASECQ) is a self-report instrument adapted to the context of physical exercise by Edmunds et al. (2006), based on the original version of Perceived Autonomy Support: Health Care Climate Questionnaire (Williams, Grow, Freedman, Ryan, & Deci, 1996), translated and validated for the Portuguese language (Moutão, Cid, Leitão, & Alves, 2012). This questionnaire consists of six items, which contribute to a single factor that evaluates the perception of autonomy support given by exercise instructor (e.g. “demonstrates confidence in my ability to perform the exercises”). The answers were responded by a Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

### 2.3.4. The Exercise Motives Inventory-2

Motives for participation in RT and CrossFit programs were measures using the exercise motives inventory-2 (EMI-2) (Markland & Hardy, 1997). The EMI-2 assessed exercise participation motives (participatory motives, referring to the “why” of goal pursuit). The original questionnaire were translated and validated to Portuguese language (Guede, Legnani, & Legnani, 2012) and contains a total of 44 items, grouped in 10 subscales: enjoyment and well-being (6 items), stress management (4 items), social recognition (4 items), affiliation (4 items), competition (5 items), health pressures (3 items), ill-health avoidance (6 items), weight management (4 items), appearance (4 item), and strength and endurance (4 items). The responses of each question are made on a 6-point Likert-type scale-ranging from 0 (*not at all true for me*) to 5 (*very true for me*).

### 2.3.5. Exercise-Related and Anthropometric Questions

Participants responded three questions that focused on their exercise-related habits. The questions concerned time elapsed from starting with training (in month or years), the average of exercise frequency in the last four weeks, and duration of the typical exercise training session. Weekly exercise volume (minutes) was determined by the product of frequency and exercise duration. Participant’s body mass and height were self-reported to calculate body mass index (BMI).

## 2.4. Statistical Analysis

Statistics analysis was performed using IBM SPSS 22 (SPSS Inc., Chicago, IL, USA). Results are expressed by mean  $\pm$  SD values, and Pearson correlation was used to test association among study variables. MANOVA was used to compare exercise groups (*i.e.*, resistance training vs. CrossFit) on the dependent variables of SDT, BPN, and EMI-2. Group's samples sizes were very unequal. Therefore, a more robust MANOVA test statistics Pillai's Trace was used, and the level of significance was set at  $p < 0.05$ . Eta partial squared ( $\eta_p^2$ ) was calculated for each MANOVA and univariate tests as a measure of effect size, considering 0.01, 0.06, and 0.14, as small, moderate, and large, respectively. The magnitude of the changes between groups was assessed using Cohen's *d* effect size and presented with their 90% confidence interval. Threshold values for 0.2 (small), 0.6 (moderate), 0.8 (large), and 1.2 (very large) were considered.

PROCESS macro SPSS was used to multiple serial mediations (Hayes, 2018). Macro's model 6 was applied with two mediators to provide the direct effect (*c'*) of the independent variable (*X*—enjoyment) on the dependent variable (*Y*—weekly exercise volume) and the indirect effect through mediator 1 (competence) and mediator 2 (intrinsic motivation). Bootstrapping with 5000 samples was used with bias-corrected. The indirect effect is considered significant if its 95% confidence interval does not cross zero ( $\alpha = 0.05$ ). No violations of the assumptions of linearity or homoscedasticity were observable through an inspection of scatterplots of the residuals indicating the data was suitable to undergo subsequent analysis. Variance inflation factors, tolerances, and Durbin-Watson statistics revealed no problems with collinearity and autocorrelation.

## 3. Results

Previous studies have supported the construct validity of the Portuguese versions of PASECQ, BPNES, and BREQ-3 in Brazil, allowing its use in the subsequent statistical analysis (Cid, Moutao, Leitao, & Alves, 2012; Klain et al., 2015). Descriptive statistics for the groups are presented in **Table 1**. Univariate analysis indicated that participants in the RT group were older ( $p < 0.05$ ), heavier ( $p < 0.01$ ), taller ( $p < 0.05$ ) and had higher BMI ( $p < 0.05$ ) as compared to participants in CrossFit group. There was no significant difference in exercise frequency and weekly exercise volume.

### 3.1. EMI-2

MANOVA revealed a significant multivariate effect on the motives to exercise, Pillai's trace = 0.271,  $F(10,482) = 17.9$ ,  $p < 0.001$ ,  $\eta_p^2 = 0.27$  (90% CI [0.20, 0.30]). Univariate analysis indicated that CrossFit participants reported higher motives for enjoyment  $F(1491) = 8.90$ ,  $p < 0.01$ ,  $\eta_p^2 = 0.02$  (90% CI [0.003, 0.04]), stress management  $F(1491) = 17.56$ ,  $p < 0.001$ ,  $\eta_p^2 = 0.03$  (90% CI [0.01, 0.06]), social recognition  $F(1491) = 6.11$ ,  $p < 0.01$ ,  $\eta_p^2 = 0.01$  (90% CI [0.001,

0.03]), affiliation  $F(1491) = 114.44$ ,  $p < 0.001$ ,  $\eta_p^2 = 0.19$  (90% CI [0.13, 0.23]), competition  $F(1491) = 24.25$ ,  $p < 0.01$ ,  $\eta_p^2 = 0.05$  (90% CI [0.02, 0.08]), and weight management  $F(1491) = 25.04$ ,  $p < 0.001$ ,  $\eta_p^2 = 0.05$  (90% CI [0.02, 0.08]), compared to RT (**Table 2**).

### 3.2. Exercise Behavioral Regulation

MANOVA revealed a significant multivariate effect for exercise behavioral regulations, Pillai's trace = 0.083,  $F(8484) = 5.45$ ,  $p < 0.001$ ,  $\eta_p^2 = 0.08$  (90% CI [0.03, 0.10]). Univariate analysis showed a higher score for intrinsic motivation in CrossFit group  $F(1491) = 15.78$ ,  $p < 0.001$ ,  $\eta_p^2 = 0.03$  (90% CI [0.01, 0.06]) and controlled motivation in RT group  $F(1491) = 4.91$ ,  $p < 0.05$ ,  $\eta_p^2 = 0.01$  (90% CI [0.0005, 0.029]) (**Table 3**). There was no significant difference between any other subscale.

**Table 1.** Descriptive statistics. Data are expressed by mean  $\pm$  standard deviation.

	Resistance Training	CrossFit
Age (years)	28.7 $\pm$ 6.84*	30.3 $\pm$ 6.74
Height (cm)	173.3 $\pm$ 9.08*	170.6 $\pm$ 8.94
Body mass (kg)	77.6 $\pm$ 14.5*	73.1 $\pm$ 12.4
BMI (kg/m <sup>2</sup> )	25.7 $\pm$ 3.6*	24.9 $\pm$ 2.94
Frequency (weekly)	4.46 $\pm$ 1.27	4.52 $\pm$ 1.10
Weekly exercise volume (min)	275.4 $\pm$ 131.1	297.7 $\pm$ 121.2
Time of practice		
<6 months	6.0%	16.4%
6 - 12 months	6.6%	22.7%
1 - 2 years	19.7%	49.2%
3 - 4 years	17.8%	10.2%
5 or more years	49.9%	1.6%

\*Indicates significant difference compared to RT. RT = Traditional resistance training.

**Table 2.** EMI-2 subscales. Data are expressed by mean  $\pm$  standard deviation.

	Resistance Training	CrossFit	Cohen's d [90% CI]
Enjoyment	4.49 $\pm$ 0.72	4.70 $\pm$ 0.52*	0.31 [0.14, 0.48]
Stress Management	3.77 $\pm$ 1.08	4.22 $\pm$ 1.0*	0.42 [0.25, 0.60]
Social Recognition	1.84 $\pm$ 1.43	2.22 $\pm$ 1.49*	0.42 [0.25, 0.60]
Affiliation	2.09 $\pm$ 1.36	3.53 $\pm$ 1.20*	0.26 [0.10, 0.43]
Competition	2.81 $\pm$ 1.49	3.56 $\pm$ 1.33*	0.51 [0.34, 0.69]
Health Rehabilitation	2.25 $\pm$ 0.90	2.24 $\pm$ 0.78	-0.01 [-0.18, 0.16]
Ill-Health Avoidance	4.08 $\pm$ 0.87	4.14 $\pm$ 0.67	0.07 [-0.01, 0.24]
Weight Management	2.83 $\pm$ 1.49	3.57 $\pm$ 1.30*	0.51 [0.34, 0.68]
Appearance	3.94 $\pm$ 0.95	3.77 $\pm$ 1.0	-0.18 [-0.35, -0.007]
Physical fitness	4.65 $\pm$ 0.60	4.55 $\pm$ 0.63	-0.16 [-0.335, 0.005]

\*Indicates significant difference compared to RT. RT = Traditional resistance training.

**Table 3.** BREQ-3 and BPN subscales. Data are expressed by mean  $\pm$  standard deviation.

	Resistance Training	CrossFit	Cohen's d [90% CI]
Amotivation	0.15 $\pm$ 0.34	0.15 $\pm$ 0.33	0 [-0.17, 0.17]
External Regulation	0.68 $\pm$ 0.80 <sup>†</sup>	0.54 $\pm$ 0.56	-0.18 [-0.35, 0.01]
Introjected Regulation	2.55 $\pm$ 1.02	2.37 $\pm$ 1.10	-0.17 [-0.34, 0.00]
Regulation Identified	3.49 $\pm$ 0.48	3.55 $\pm$ 0.43	0.13 [-0.041, 0.29]
Integrated Regulation	3.67 $\pm$ 0.54	3.58 $\pm$ 0.51	-0.17 [-0.34, 0.00]
Intrinsic Regulation	3.59 $\pm$ 0.51	3.78 $\pm$ 0.33*	0.40 [0.23, 0.57]
Controlled motivation	1.61 $\pm$ 0.70 <sup>†</sup>	1.46 $\pm$ 0.63	-0.22 [-0.38, 0.05]
Autonomous motivation	3.58 $\pm$ 0.40	3.63 $\pm$ 0.34	0.13 [-0.03, 0.30]
BPN Relatedness	4.11 $\pm$ 0.92	4.51 $\pm$ 0.61*	0.47 [0.30, 0.64]
BPN Competence	4.39 $\pm$ 0.62	4.40 $\pm$ 0.54	0.01 [-0.15, 0.18]
BPN Autonomy	4.41 $\pm$ 0.65 <sup>†</sup>	4.12 $\pm$ 0.71	-0.43 [-0.60, -0.26]
Autonomy Support	5.77 $\pm$ 1.44	5.90 $\pm$ 1.05	0.09 [-0.07, 0.26]

\*Indicates significant difference compared to RT. <sup>†</sup>Indicates significant difference compared to CrossFit. RT = Traditional resistance training.

Weekly exercise volume was examined by a tertile-split subgroup of intrinsic motivation (CrossFit and RT values collapsed) as presented in **Figure 1**. Weekly exercise volume was significantly different between subgroups of intrinsic motivation  $F(2490) = 14.98$ ,  $p < 0.001$ ,  $\eta_p^2 = 0.06$  (90% CI [0.02, 0.09]). Tukey HSD revealed that practitioners with higher intrinsic motivation presented greater weekly exercise volume when compared to intermediate ( $p < 0.01$ , Cohen's  $d = 0.44$ , 90% CI [0.27, 0.62]), and lower intrinsic motivation ( $p < 0.01$ , Cohen's  $d = 0.51$ , 90% CI [0.32, 0.70]).

### 3.3. Basic Psychological Needs Satisfaction

Significant differences were observed between groups for satisfaction of BPN, Pillai's trace = 0.116,  $F(3489) = 21.35$ ,  $p < 0.001$ ,  $\eta_p^2 = 0.11$  (90% CI [0.07, 0.15]) (**Table 3**). Univariate analysis indicated that CrossFit participants had higher levels of perception of relatedness as compared with RT  $F(1491) = 21.06$ ,  $p < 0.001$ ,  $\eta_p^2 = 0.04$  (90% CI [0.01, 0.07]), while RT participants demonstrated more autonomy than CrossFit practitioners  $F(1491) = 16.61$ ,  $p < 0.001$ ,  $\eta_p^2 = 0.03$  (90% CI [0.01, 0.06]). There was no significant difference for perceived autonomy support and competence between groups.

### 3.4. Correlations Analysis

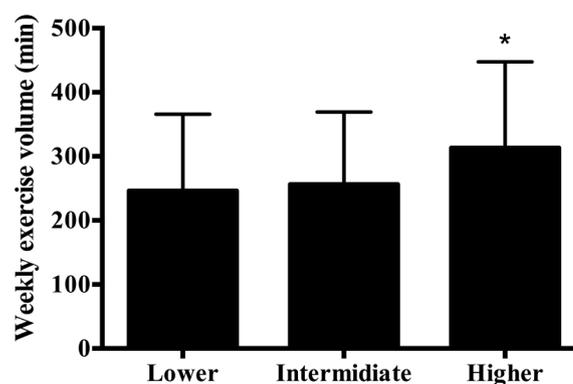
Correlations analyses were conducted between each of the variables of the BREQ-3 and BPN satisfaction. Consistent with SDT, there were significant associations between psychological needs and exercise behavioral regulation constructs. Perceived competence was positively related to identified regulation ( $r = 0.26$ ,  $p < 0.01$ ), integrated regulation ( $r = 0.51$ ,  $p < 0.01$ ), and with intrinsic reg-

ulation ( $r = 0.5, p < 0.01$ ). As expected, perception of competence was negatively related external regulation ( $r = -0.17, p < 0.01$ ). Perceived autonomy was associated with identified regulation ( $r = 0.27, p < 0.01$ ), integrated regulation ( $r = 0.53, p < 0.01$ ), intrinsic regulation ( $r = 0.38, p < 0.01$ ). In the same way, relatedness satisfaction was associated with identified regulation ( $r = 0.19, p < 0.01$ ), integrated regulation ( $r = 0.26, p < 0.01$ ), intrinsic regulation ( $r = 0.30, p < 0.01$ ).

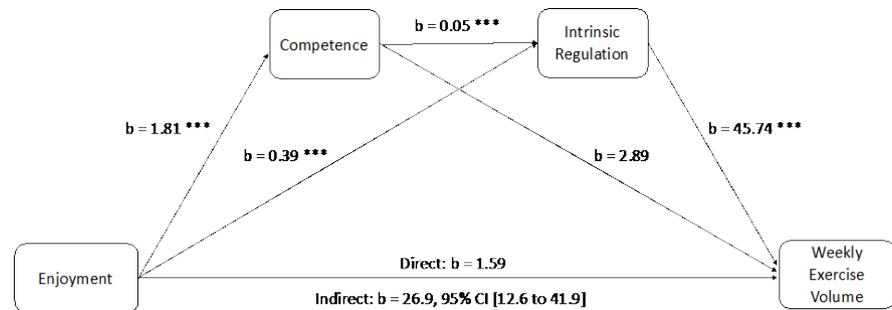
Based on the results of T-tests, there was no significant difference between groups for exercise frequency and weekly exercise volume; therefore, correlations analysis was performed with pooled data. Exercise frequency ( $r = 0.24, p < 0.01$ ) and weekly exercise volume ( $r = 0.22, p < 0.01$ ) were positively related with intrinsic motivation. In addition, exercise frequency was positively associated with more autonomous forms of extrinsic motivation such as, identified regulation ( $r = 0.11, p < 0.05$ ) and integrated regulation ( $r = 0.24, p < 0.01$ ). External regulation was negatively related with exercise frequency ( $r = -0.24, p < 0.01$ ) and weekly exercise volume ( $r = -0.17, p < 0.01$ ). Regarding BPN, exercise frequency ( $r = 0.28, p < 0.01$ ) and weekly exercise volume ( $r = 0.013, p < 0.01$ ) were related to competence, while exercise frequency was associated to autonomy. In addition, exercise frequency and weekly exercise volume, respectively, were correlated with enjoyment ( $r = 0.20, p < 0.01$ ;  $r = 0.16, p < 0.01$ ), competition ( $r = 0.19, p < 0.01$ ;  $r = 0.17, p < 0.01$ ), and social recognition ( $r = 0.14, p < 0.01$ ;  $r = 0.09, p < 0.05$ ). Unexpectedly, Ill-health avoidance ( $r = -0.11, p < 0.05$ ) was negatively related to weekly exercise volume.

### 3.5. Mediation Analysis

**Figure 2** presents the mediating effects of competence (mediator 1) and intrinsic motivation (mediator 2) in the relationship between enjoyment (independent variable) and weekly exercise volume (dependent variable), while sex, exercise modality (RT and CrossFit) and age were set as covariates.



**Figure 1.** Weekly exercise volume defined by tertile of intrinsic motivation. Higher = higher intrinsic motivation; Intermediate = Intermediate intrinsic motivation; Lower = Lower intrinsic motivation. \*significant different as compared to intermediate and lower tertile  $p < 0.05$ .



**Figure 2.** Mediation analysis for enjoyment, competence, intrinsic regulation and weekly exercise volume. \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

Enjoyment could significantly predict the perception of competence (path  $a_1$ ,  $b = 1.81$ ,  $p < 0.001$ ) and intrinsic regulation to exercise (path  $a_2$ ,  $b = 0.39$ ,  $p < 0.001$ ); therefore, participants who reported higher scores of enjoyment are more likely to perceive their competence and, in consequence, foster the intrinsic motivation to exercise.

As we expected, higher score of competence predicted intrinsic regulation to exercise (path  $d$ ,  $b = 0.47$ ,  $p < 0.001$ ). Direct effect of enjoyment on weekly exercise volume was not significant (path  $c'$ ,  $b = 1.59$ ,  $t(486) = 0.13$ ,  $p = 0.89$ , 95% CI [-21.6 to 24.8]), suggesting no evidence that enjoyment influenced the weekly exercise volume independent of their effects on competence and the intrinsic motivation. In addition, the total indirect effect of enjoyment through the two mediators (*i.e.*, competence and intrinsic regulation) was significant ( $b = 26.9$ , 95% CI [12.6 to 31.9]).

#### 4. Discussion

The present study was designed to compare the motivational underpinnings of the CrossFit and traditional RT participation in order to advance understanding of motives for exercise, basic psychological need satisfaction, and behavioral regulation. In agreement with tenets of SDT in exercise domain, our findings showed that enjoyment, higher levels of competence need satisfaction, and intrinsic motivation all play a positive role in CrossFit and RT participation. Our data are in agreement with previous articles suggesting that the intrinsic motivation seems to predict RT participation (Caudwell & Keatley, 2016), meeting health organization RT recommendations (Kathrins & Turbow, 2010).

Previous research pointed out that adherence to exercise in person participating in fitness classes is higher when intrinsic motives related to enjoyment and feeling of competence, compared to body related outcomes (Ryan et al., 1997). In fact, our data showed a positive association between enjoyment and exercise participation. Exercise enjoyment leads to increased persistence, reduced stress, positive psychological feelings, confident and satisfied in the activity itself (Teixeira et al., 2012). Teixeira et al. (2012) have showed that intrinsic motives (e.g., enjoyment, affiliation, challenge) were positively associated with exercise behavior. The predominance of intrinsic participation motives such as affiliation,

challenge, stress management, and enjoyment, is clearly associated with greater exercise adoption and adherence. In the current study, more than 53% of the participants reported that they are engaged in their training modalities for a period more than 3 years. It could explain the high levels of enjoyment reported in both CrossFit and RT groups. In fact, long-term participants reported enjoyment as their principal reason for exercise adoption (Edmunds et al., 2006).

In the present study, no independent effect of the enjoyment motive for exercise was observed for self-reported weekly exercise volume. This is in agreement with recent research suggesting that motives for exercise only exert an indirect effect on exercise behavior (Duncan et al., 2017; Sebire, Standage, & Vansteenkiste, 2011; Sibley & Bergman, 2016). For example, Ingledew and Markland (2008) have reported the exercise motive as an antecedent to behavioral regulation. In other words, different motives to participation are more or less conducive to controlled or autonomous motivation, with different consequences for behavior and affect. Our study advanced previous work by demonstrating that the effect enjoyment on exercise behavior in fitness center users may be mediated by competence satisfaction and intrinsic motivation.

Intrinsic motivation significantly predicted higher weekly exercise volume, supporting the link between intrinsic motivation to engage in exercise and continued, persistent physical activity behavior. In light of structured and intense nature of RT and CrossFit workouts, participants may require more satisfaction of competence and intrinsic motivation to engage regularly in these activities. Moderate and light exercise seems either not to be related, or weakly associated with BPN satisfaction. On the other hand, strenuous exercise has been shown to moderately associated with BPN and intrinsic motivation (Weman-Josefsson et al., 2015). Based on this result, the enjoyment can be proposed as a reason to exercise adoption that plays a role in satisfying individual's need for competence, and foster the intrinsic motivation. According to SDT, individuals are intrinsically motivated when they engage in an activity for the inherent satisfaction that they derive from the activity, being a more self-determination motivation (Ryan & Deci, 2000). Intrinsically motivated individuals are likely to persist with gym attendance without external contingencies such as rewards or social pressure (Caudwell & Keatley, 2016).

CrossFit members perceived greater relationship need satisfaction, while RT participants scored higher perception of autonomy. Autonomy score in the RT participants was as high as previously reported in fitness center users and personal trainer clients (Klain et al., 2015). In comparison to RT, individuals who exercise at a CrossFit facility must perform the specific workout prescribed by the instructor, and at a specific time. In this case, the reduced freedom of choice may explain lower feeling of autonomy reported by CrossFit participants. Exercise environment could influence the means by which BPN are fulfilled, as well as how behavioral regulations are internalized. As has been forwarded by others (Pridgeon & Grogan, 2011), exercise environment is an important factor to exercise initiation and adherence.

With respect of motives to exercise, CrossFit participants reported higher social motives (social recognition, affiliation, and competition) compared to RT. In according to this data, Fisher et al. (2017) found similar findings comparing CrossFit members and participants who performed RT, with or without a personal trainer. A greater sense of community and social interactions seems to be particular characteristics in CrossFit workouts (Claudino et al., 2018). Affiliation motive is classified as an intrinsic goal, while social recognition is derived from extrinsic reason of receiving attention from others for physical abilities and performance (Wallhead, Garn, & Vidoni, 2013). It is possible that in individuals with high affiliation goals, the potential detrimental effect of social recognition on adherence may be disregarded (Fisher et al., 2017). Group exercise modalities contribute to social engagement, and this could explain, at least in part, some differences between CrossFit and traditional RT onto other psychological variables (Ingledeu & Markland, 2008). This observation is supported by the higher levels of BPN of relationship reported by CrossFit members in the present study. The consistent organization of CrossFit classes likely increases the quality of relationships between participants, since they workout with the same people every day.

Workout environment in CrossFit group may have direct effects on competition and enjoyment scores, in which are comparable with that presented in sports practice (Claudino et al., 2018). Kilpatrick, Herbert and Bartholomew (2005) showed greater motivation to participate in sport than to regular exercise for affiliation, challenge, enjoyment and social recognition. Further, Frederick and Ryan (1993) compared the motives of individuals who either participated in individual sports or fitness activities. The results indicated that sport participants reported enjoyment and competence as the highest motivating factors, whereas fitness participants reported more body-related motives such as appearance. A competitive nature of CrossFit is perceived when the participants demonstrate their performance and, at the same time, analyze the performance of their training colleagues, through subjective (perception) and numerical analysis (e.g., results of time and other performance variables, usually written in a whiteboard on the gym's wall) (Sibley & Bergman, 2017).

Appearance and weight management are considered extrinsic motivators to exercise due to their controlling nature (Ingledeu & Markland, 2008; Ingledeu et al., 2009). Since RT participants revealed greater controlled regulation than CrossFit group, we expected that RT participants would show appearance as a higher motive to exercise in accordance with a previous study (Fisher et al., 2017). Cross-sectional and longitudinal studies have demonstrated that controlled motivation did not predict, or negatively predicted, exercise participation (Silva et al., 2011; Teixeira et al., 2012). No differences were documented between groups in exercise participation; however, a negative correlation was found between controlled motivation and exercise frequency and weekly exercise volume. CrossFit group scored weight management as a higher motivator than RT. Recently, Caudwell and Keatley (2016) indicated that men with higher

negative views toward their body fat also reported greater gym attendance per week.

Although the current study was sufficiently powered, some limitations should be considered. First, the present study was cross-sectional designed; therefore, no causality can be inferred. Second, as the majority of the participants in this study were young, well educated, highly motivated, and regularly engaged in CrossFit and traditional RT, the association explored in the preset study should also be examined with caution. Third, weekly exercise volume was assessed by self-reported questionnaire. Longitudinal studies are required to explore the temporal interplay between exercise-related psychological needs satisfaction, motives for exercise, behavioral regulation, and exercise participation.

## 5. Conclusion

Our results suggest that CrossFit members reported higher levels of intrinsic motives and intrinsic motivation to exercise. On the other hand, RT participants presented greater motive for appearance and higher levels of external regulation. Serial mediation analysis evidenced that the association of enjoyment and weekly exercise volume is mediated by competence need satisfaction and intrinsic regulation.

Some practical applications from this study are considered. First, exercise professionals can encourage individuals to seek self-determined and personally meaningful exercise benefits. Affective benefits and intrinsic goals should be emphasized, but without explicitly or implicitly denigrate appearance, weight control, or any other extrinsic motive for exercising (Ingledeu & Markland, 2008). Second, participants of both RT and CrossFit groups perceived competence as a mediator of exercise behavior, indicating that focusing on improvement mastery over new skills is an important factor for these individuals. Fitness instructors can incorporate higher-skill movements (e.g., Olympic weightlifting, plyometric exercises) into the exercise program, with emphasis on appropriate learning progression and self-referenced improvements. Third, exercise professionals can support their client's perception of autonomy by offering them choices, regarding exercise selection, order, and intensity. The adjustment of the exercise workload might be important for increasing exercise enjoyment.

## Acknowledgements

The authors thank the Coordination of Improvement of Higher Educational Personnel (CAPES).

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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