



Motivation to CrossFit training: a narrative review

Fábio Hech Dominski¹ · Thiago Sousa Matias² · Thiago Teixeira Serafim¹ · Yuri Feito³

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Abstract

Introduction Considering the ongoing growth of CrossFit training, it is pertinent to examine the motivational characteristics of individuals who engage in this type of training modality.

Purpose This study aimed to examine the motivational characteristics displayed by individuals participating in CrossFit training through a narrative review.

Methods Four electronic databases (PubMed, SCOPUS, SPORTDiscus, and Web of Science) were searched from their inception to June 2019, with search criteria including terms related to motivation and exercise. We selected only original articles that investigated motivation among CrossFit training participants.

Results Fourteen studies met the inclusion criteria. The individuals' motivation was mainly characterized by more autonomous forms of extrinsic motivation (identified and integrate regulations). The role of extrinsic motives is explained by the possibility of improving physical abilities/skills, health-related factors and well-being, and performance and competition affective responses. Compared with other forms of resistance training, motivational characteristics of individuals engaged in CrossFit training seem to be different, whereby those engaged in CrossFit training exude a high level of self-determination, and may experience a greater sense of satisfaction and pleasure.

Conclusion The present narrative review adds to the limited evidence related to CrossFit training and suggests that participation in CrossFit training is conducted with a great sense of belief and identify. Moreover, CrossFit training seems to provide inherent rewards, which may influence exercise adherence. Future studies should explore motivations and reasons as to why individuals dropout of participating in CrossFit training.

Keywords Motivation · Sport psychology · High-intensity interval training · Physical fitness · Resistance training

Introduction

Resistance training (RT) offers health benefits [1] and is recommended, according to the American College of Sports Medicine [2], at least twice a week involving each major muscle group. RT is considered a general term and includes several modalities of training (e.g. powerlifting, bodybuilding, etc.). Over the last decade, CrossFit training, a conditioning programme characterized by high-intensity functional training (HIFT) [3, 4], has emerged as a valuable RT training methodology. In addition to RT exercises, CrossFit training is characterized by constant variability of functional (i.e. multi-joint) movements, including a variety of training strategies, such as Olympic lifting, calisthenics, strength/power, gymnastic movements, plyometric exercises, running and rowing [3–5], whereby the aim is to increase volume and intensity loads to improve performance [6].

✉ Fábio Hech Dominski
fabio.dominski@udesc.br

Thiago Sousa Matias
thiago.matias@ufsc.br

Thiago Teixeira Serafim
thiagotserafim@outlook.com

Yuri Feito
yfeito@kennesaw.edu

¹ Laboratory of Sport and Exercise Psychology, Santa Catarina State University, Pascoal Simone, 358, Coqueiros, Florianópolis, SC 88080-350, Brazil

² Research Center of Physical Activity and Health, School of Sports, Federal University of Santa Catarina, Florianópolis, Brazil

³ Department of Exercise Science and Sport Management, Kennesaw State University, Kennesaw, GA, USA

Created in the late 1990s, CrossFit has become a world-wide brand and is currently present in 142 countries on 7 continents, with over 14,000 official affiliates [7]; the number of participants has increased over the last decade, and today, CrossFit training is performed by not only healthy individuals, but also individuals with chronic conditions, such as obesity and type 2 diabetes mellitus, among others [8–12].

Moreover, it seems that CrossFit training has emerged as a motivational alternative to traditional RT models since many RT programmes are individualized, have little or no professional supervision and have few goals related to learning skills or meeting specific session goals [12]. In this sense, recent evidences suggest that CrossFit training's social nature can meet the individual's basic psychological needs, promote feelings of pleasure and satisfaction, and drive more intrinsic motivational behaviours [9, 13, 14]. As such, CrossFit training has assumed the social nature of sports environments and has created a context in which the sense of affiliation and the creation of communities emerge as an important condition for behaviour change [9, 13, 14].

It is observed that the training sessions allow individuals of different levels and experience to participate simultaneously, thus individual's behaviour is self-regulated. From this perspective, each training session then translates into an opportunity to improve performance, which ultimately will provide a greater sense of satisfaction and self-determination to initiate and maintain exercise over time. Moreover, the competitive nature of each training session, where individuals can compete against themselves, or compare their performance with others in the group [5], may be an important factor to increasing the sense of exercise utility [15].

In this context, the present study draws attention to the need for an understanding of different exercise contexts as a function of specific affect, interpersonal, social and psychological variants that could influence positive related outcomes [16]. Indeed, a broader view of motivational frameworks that implies the identification of the regulating contingents that relate to exercise behaviour can be used as a basis for more effective and healthy exercise intervention [17]. Evidence on the affective dispositions of CrossFit training is in conformity with some motivation theoretical frameworks. The Self-Determination Theory (SDT) [18], for example, explicitly assumes that autonomy, relatedness and competence are basic psychological needs (BPNs) and, when provided, favour behaviours regulated by more self-determined principles with pleasure and satisfaction [19]. In this sense, the motivational regulations of CrossFit training are suggested to be associated with the provision of BPNs, fostering behaviours that intrinsically promote motivation [12, 20]. It seems that, unlike more traditional exercise modalities, CrossFit training provides individuals with an opportunity to achieve their goals with efficiency and

control, building positive and meaningful social networks and increasing their identity with exercise behaviour [9, 14].

However, early researches investigating affective responses in the context of high-intensity training observed an inverse relationship in which engagement in high-intensity activity is likely to decrease pleasure during exercise [21]. Thus, some environmental conditioning of the exercise may not support more autonomous motivations but may frustrate the psychological needs or value the extrinsic motivation. In general, exercise participation typically occurs as a result of extrinsic motivators, such as losing weight, improving appearance or obtaining an award [22]. Although extrinsic motivation is not pejorative to exercise behaviour, it may hinder the maintenance of individual behaviour towards exercise [23]. Nonetheless, highly competitive environments can lead to individuals responding with a greater degree of anxiety and frustration when the outcome expectations are not satisfactory.

The relationship between high-intensity training programmes and motivation needs further exploration. In this context, summarizing the findings of the literature is an important research strategy. It is unknown whether CrossFit differs from other contexts within the bases of theory-based constructs, whether motivational characteristics relate to or have links to duration and frequency of CrossFit participation, and whether demographic variables lead to changes in motivational outcomes. This study aimed to examine the motivational characteristics displayed by individuals participating in CrossFit training through a narrative review of the existing literature.

Materials and methods

To provide an exploratory overview of the literature related to the motivational characteristics of individuals engaged in CrossFit training, and considering the limited evidence available, a narrative review was carried out. In particular, review questions were addressed: what are the motivational features of individuals joining in CrossFit training (motivation-related outcomes such as needs support/frustration, individual needs satisfaction/frustration, type and quality of motivation)? Can differences in motivational characteristics be attributed to the exercise setting? Do the motivational characteristics vary by age, sex, duration and frequency of participation in CrossFit training?

Search strategy

Studies were searched for using the following electronic databases: PubMed (National Library of Medicine and National Institutes of Health), SCOPUS, SPORTDiscus via EBSCO, and Web of Science (Main Collection-Thomson

Reuters Scientific). In searching for the studies, the primary and secondary search terms were included in the title, abstract and subject field of each database. The key search terms used were related to motivation (Motivation OR Motivational OR “Motivational climate” OR Self-determination OR “Autonomous motivation” OR “Autonomous regulation” OR “Intrinsic motivation” OR “Controlled regulation” OR Autonomy OR “Treatment regulations” OR Goals OR Motives OR “Basic needs” OR “Autonomy-supportive climate”) and exercise (CrossFit OR “High-intensity functional training” OR “Extreme conditioning program”) and combinations thereof. The entire search process was conducted by two independent researchers (FHD and TTS). In the case of disagreement, a third reviewer was consulted for the final decision (TSM). In addition, authors also searched through reference lists of all identified studies to find further relevant articles.

Eligibility criteria

Studies were deemed eligible for inclusion if they met the following criteria: (1) were original articles (cross-sectional studies, randomized control trial, non-randomized clinical trial) published in either the English, Portuguese or Spanish language; (2) investigated motivation among CrossFit training participants, defined as individuals who participate in CrossFit training in official affiliated facilities or “boxes”; (3) were quantitative and qualitative studies with an abstract and full text available online through to June 6th, 2019. Studies were excluded if they: (1) were review articles, case studies, conference proceedings, editorials, abstracts and letters. Additionally, we did not restrict the search with a starting date so as to provide a comprehensive review of the literature.

Study selection and data extraction

Initially, authors screened all titles and abstracts; posteriorly, we reviewed the full texts of articles that met our predetermined inclusion and exclusion criteria. We have pointed out why studies were excluded in the abstract and full-text review. After the studies were selected, the authors independently extracted data from all included studies (differences were resolved by consensus). For the analysis and discussion of the results, the following data were extracted: sample (profile, number, sex, age); study design; instruments; theoretical frameworks used (if applicable); intervention; results; and funding of studies. We have divided the results section according to the main findings carried out by the studies: motivational characteristics of participants; comparison of motivational factors related to CrossFit training and other resistance exercise modalities; duration and frequency of participation; and age and sex comparison.

Results

The initial search resulted in 241 articles using the combination of selected terms (Fig. 1). Of those, 17 articles were removed as they appeared as duplicates in the various databases, while 186 studies were removed after a title review and not meeting the inclusion criteria. Thirty-eight studies were selected for abstract review and 26 were excluded as studies did not investigate motivation ($n=12$), the study design did not meet the inclusion criteria ($n=8$), or the study did not investigate CrossFit training, as defined here ($n=6$). Therefore, 12 full-text articles along with 3 additional studies identified by reference checking were included. Additionally, one article was removed from the final total as it did not study CrossFit training specifically. Therefore, a total of 14 studies were included in this narrative review (Fig. 1).

Overview of the research

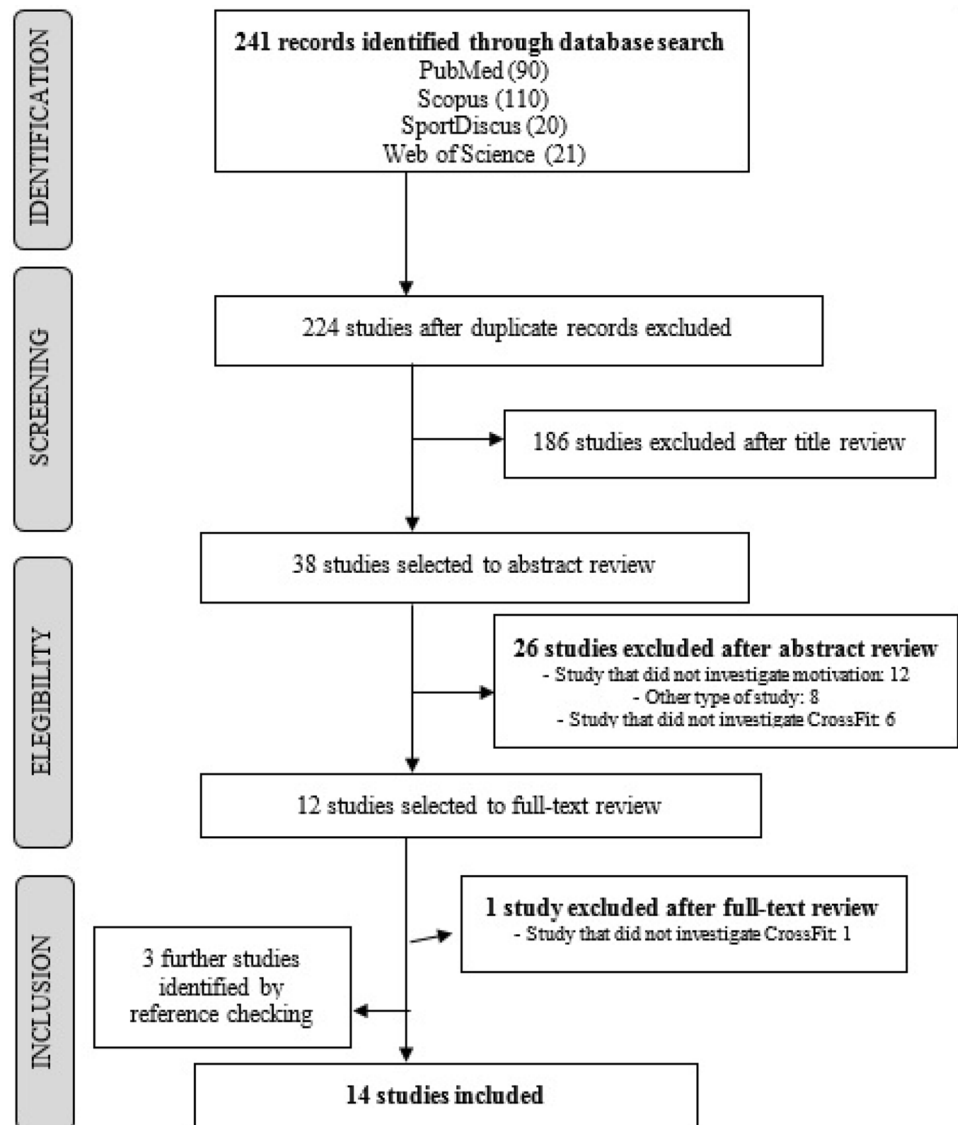
With regard to the study design, two studies (14.3%) used a qualitative design (semi-structured interview and focus group), and the remaining 12 studies (85.7%) used a quantitative design (cross-sectional $n=11$, experimental $n=1$). Eight of the 14 studies performed online data collection. The pooled sample size for this review was 4535 participants with 3610 participants (79.6%) in the CrossFit training group and 925 (20.4%) in other exercise groups. The sample comprised 2428 (53.53%) men and 2107 (46.47%) women; the sample sizes ranged from 17 to 735. Regarding the data collection related to motivation, the instrument most used in these studies was the Exercise Motivation Inventory (EMI-2), in four studies. The EMI-2 is a 51-item scale comprising 14 different subscales [24], which require participants to reply to statements concerning reasons why they currently exercised and whether they exercised regularly or not. Regarding funding of the studies, eight studies reviewed did not report any information about funding, four studies mentioned their funding agencies and three stated that they did not receive financial support.

Table 1 presents the sample (profile, sample size, sex, age), experimental design, method of analysis and the selected studies' main findings regarding motivation.

Theoretical frameworks

Eleven of the 14 studies explicitly described the theoretical framework used for each study. Nine studies used the Self-Determination Theory (SDT) [12–14, 25–30], while one used the Achievement Goal Theory (AGT) [31] and another used both theories [32].

Fig. 1 Flow diagram illustrating literature research and selection process



Motivational characteristics of participants engaged in CrossFit training

According to the reviewed studies, the motivational characteristics of participants who engage in CrossFit training rely on more autonomous forms of motivation. It was observed that most motivational reasons were characterized by autonomous forms of extrinsic motivation, such as identified and integrated regulations, and by intrinsic regulation.

The role of extrinsic motives was characterized by improving physical abilities/skills, health-related factors and well-being [12, 33]. Performance and competition appeared as a feature of individuals' motivations for [13, 14, 26, 28, 31]. CrossFit training participants showed higher levels of intrinsic motives, such as enjoyment, challenge and affiliation [9, 14, 26]. Sibley and Bergman [12] observed that the levels of competence and relatedness were greater among

CrossFit training participants than what is typically observed in similar exercise domains. The controlled locus of causality for CrossFit training engagement also appeared; the choice to participate is fuelled by a controlled behavior, such as wanting to lose weight, to get fit, or to avoid social disapproval [10, 26]. Nielsen et al. [27] observed that the valuation of individual performance and comparing them to the others was a motivating factor.

Comparison of motivational factors related to CrossFit training and other resistance exercise modalities

Five studies compared motivational factors between individuals who engaged in CrossFit training and other modalities of exercise and sports—resistance exercise, aerobic training, football, spinning, and moderate-intensity training [9, 10,

Table 1 Main findings of studies about motivation to CrossFit training

Article, authors	Sample (profile, <i>n</i> , sex, age)	Experimental design	Method of analysis of motivation	Main findings—motivation
Heinrich et al. [10]	23 (56.5% women) Group-based high-intensity functional training (HIFT- CrossFit): 9 participants; Group moderate-intensity aerobic and resistance training (ART): 9 participants; 26.8 years	Experimental	Qualitative; At baseline, participants were asked to indicate why they were interested in participating in the study. At posttest, participants were asked if they planned to continue exercising and what type of exercise they planned to do	Overall, 9 participants (39.1%) listed only intrinsic reasons and 13 (56.5%) listed both intrinsic and extrinsic reasons. HIFT participants were extrinsically motivated to participate by wanting to lose weight ($n=5$). Intrinsic reasons included to have the motivation to exercise ($n=4$), to develop an exercise habit ($n=3$), to improve health ($n=3$), to see results ($n=3$), to improve fitness/get into shape ($n=2$), and to be exposed to a new type of exercise ($n=1$). Three participants dropped out of the HIFT group, one citing scheduling issues, one having a pulled groin muscle, and one not providing a reason. All HIFT participants ($n=9$) intended to continue the same exercise as compared to only 55.6% of ART participants
Nielsen et al. [27]	Trained people 28 Group 1 (football): 8 men, Group 2 (football): 8 men, Group 3 (spinning and CrossFit): 12 men	Qualitative	Focus group interviews	The spinning/CrossFit participants did not mention the word friendship in the interviews, which suggests that the need for relatedness was satisfied to a lesser extent in their group than in the football groups In CrossFit, writing up their individual performance and comparing them to the others was a motivating factor for some
Partridge et al. [31]	Trained people 144 (56 Men and 88 Women); 34.4 years	Cross-sectional	Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2)	Males reported higher levels of performance approach goals and females reported higher levels of master avoidance goals Participants who were members of CrossFit for fewer than 6 months reported higher levels of both mastery-oriented goals than participants who were members for more than 6 months

Table 1 (continued)

Article, authors	Sample (profile, <i>n</i> , sex, age)	Experimental design	Method of analysis of motivation	Main findings—motivation
Davies, Coleman, and Stellino [25]	Trained people 206; 37.6 years	Cross-sectional	Behavioral Regulations in Exercise Questionnaire-2 (BREQ-2) (Online survey)	The sample reported high satisfaction in the relatedness and autonomy feed, followed by competence need satisfaction levels. Participants who attended CrossFit more frequently had significantly higher levels of basic need satisfaction across all three needs. The three basic needs explained 38.8% of the variance in autonomous regulation, while explaining 5.7% of the variance in controlled regulation toward CrossFit
Fisher et al. [9]	Trained people (CrossFit: 68, Group Resistance Exercise: 55, Alone: 125, Personal Trainer: 66) 314 (132 Men and 182 Women); 36 years	Cross-sectional	Exercise Motivation Inventory (EMI-2) (Online survey)	CrossFit participants were more likely to report higher levels of intrinsic motives, such as enjoyment, challenge and affiliation ($p < 0.05$) compared to other groups of resistance training CrossFit and Group Resistance Exercise ranked the highest for social recognition; they also reported competition as a motive significantly higher than alone and personal trainer participants CrossFit and Personal trainer reported strength and endurance a higher motive to their exercise than Group Resistance Exercise and Alone participants
Kóteles, Kollsete, and Kollsete [33]	Trained people 186 (57.5% women); 28.9 years	Cross-sectional	WHO-Five Well-being Index (WHO-5); Positive and Negative Affect Schedule (PANAS); Rosenberg Self-Esteem Scale (RSES); Body Image Ideals Questionnaire (BIQ); Body Awareness Questionnaire; Body Competence Scale (BC). (Online survey)	Approximately half of the participants (50.5%) mentioned improved physical abilities (strength, fitness, etc.) and health-related factors (49.5%, including prevention; e.g. being or remaining healthy) as a motive for doing CrossFit exercises Improvement of functional skills was emphasized by 36.6% of participants. Other important factors were well-being (23.1%), attractiveness (13.4%), joy (12.4%), and weight management (10.2%). Competition as a motive was mentioned only by 7 participants (3.8%)

Table 1 (continued)

Article, authors	Sample (profile, <i>n</i> , sex, age)	Experimental design	Method of analysis of motivation	Main findings—motivation
Bycura, Feito, and Pather [13]	Trained people (with > 3 months experience); 732 (388 Men and 344 Women); 32.3 years	Cross-sectional	Exercise Motivation Inventory (EMI-2) (Online survey)	Revitalization, enjoyment, affiliation, and competition were all significantly correlated with both duration and frequency of participation in CrossFit® training. A significant negative correlation was observed between weight management and both duration and frequency of participation. Frequency, but not duration, of participation was also positively correlated with items related to stress management, challenge, social recognition, strength and endurance, and nimbleness Women were more likely to place greater emphasis on factors related to stress, weight management, and appearance compared to men. Men placed greater importance on factors associated with challenge, social recognition, competition, strength and endurance, and nimbleness
Sibley and Bergman [12]	Trained people; 322 (65.2% Men); 33.9 years	Cross-sectional	Goal Content for Exercise Questionnaire (GCEQ); Basic needs satisfaction at work (BNSW) scale; Behavioral Regulation in Exercise Questionnaire	Participants demonstrated having intrinsic goals, such as developing skills or improving health, was found to predict greater psychological need satisfaction. Competence and autonomy need satisfaction were found to predict higher levels of intrinsic and identified regulations. Participation frequency was positively predicted by intrinsic regulation, intrinsic goal contents, competence need satisfaction, and was negatively predicted by external regulation
Simpson et al. [28]	Trained people (at least three months); 17 (5 Men and 12 Women); 34.9 years	Qualitative	Semi-Structured Interview	The participants expressed that CrossFit is a demanding and rigorous workout regimen and felt as though they needed to embrace the challenge that can come with exerting one physically In their first day of CrossFit participants described being physically challenged unlike they ever had been before during an exercise workout. Participants expressed feeling intimidated by seeing others successfully completing CrossFit routines

Table 1 (continued)

Article, authors	Sample (profile, <i>n</i> , sex, age)	Experimental design	Method of analysis of motivation	Main findings—motivation
Ayar [32]	Trained people; 200 (161 Men and 39 Women)	Cross-sectional	Recreational Exercise Motivation Scale (REMs)	Differences have been found between motivation factors that affect individuals to participate in recreative sports and some of the demographical parameters in some variables of REMM's health, rivalry, physical appearance, social/entertainment and skill development sub-dimensions Male participants attend to exercises in CrossFit centers with competitive reasons more than female participants
Feito et al. [14]	Trained people (with > 3 months experience); 732 (388 Men and 344 Women); 32.3 years	Cross-sectional	Exercise Motivation Inventory (EMI-2) (Online survey)	The results showed that individuals training < 3 days/week scored lowest on enjoyment, affiliation, and competition motives. Those training > 5 days/week scored highest on challenge, social recognition, strength and endurance, and nimbleness motives, but lowest on weight management
Martin et al. [26]	Trained people; 493 (348 Men and 145 Women) (365 traditional resistance training and 128 CrossFit)	Cross-sectional	Behavioral Regulations in Exercise Questionnaire 3 (BREQ-3), Basic Psychological Needs in Exercise Scale (BPNES), Exercise Climate Questionnaire (PASECQ), Exercise Motivation Inventory (EMI-2) (Online survey)	CrossFit participants presented higher levels of enjoyment, stress management, social recognition, affiliation, competition, and weight management. CrossFit participants showed higher intrinsic motivation than resistance training participants. The resistance training group showed higher controlled motivation. CrossFit participants had higher levels of perception of relatedness as compared with resistance training participants. Both 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

Table 1 (continued)

Article, authors	Sample (profile, <i>n</i> , sex, age)	Experimental design	Method of analysis of motivation	Main findings—motivation
Box et al. [29]	Trained people; 403 (148 Men and 255 Women); 36.3 years (89 CrossFit, 127 Resistance training, 97 Aerobic training, 59 Group exercise, 31 Sport)	Cross-sectional	Big Five Inventory (BFI), Exercise Motivation Inventory (EMI-2), and the Behavioural Regulation in Exercise Questionnaire (BREQ-3) (Online survey)	It seemed that those who selected CrossFit training as their primary mode of physical activity reported stronger motivation across the majority of participatory motives in comparison to the other modes. CrossFit training participants reported the greatest levels of intrinsic motivation. Interpersonal motives were greater among those engaging in CrossFit training and Sport, but not Group exercise, while fitness-, body-, and intrapersonal motivation was more variable across primary modes of physical activity.
Box et al. [30]	Trained people (with > 3 months experience); 735 (53.1 % Men); 32.4 years	Cross-sectional	Exercise Motivation Inventory (EMI-2) (Online survey)	Older participants (> 50y) scored higher on health-related motives, while younger participants (25–32 y) scored higher on social motives relative to their counterparts.

26, 27, 29]. Fisher et al. [9] showed the group engaged in CrossFit training demonstrated higher motives for affiliation (classified as an intrinsic goal) compared to the resistance exercise group, with individuals who performed resistance exercise alone and with those who performed resistance exercise one to one with a personal trainer. In Fisher et al.'s [9] study, CrossFit training group and resistance exercise reported competition as a motive significantly more often than other groups. Moreover, the CrossFit training group and those with a personal trainer reported strength and endurance as a reason for participating in the exercise [9]. Enjoyment as a motivational factor was higher in the CrossFit training group compared to the others [9]. Marin et al. [26] and Box et al. [29] showed similar results regarding CrossFit participants compared with other groups, with greater levels of intrinsic motivation.

Duration and frequency of participation in CrossFit training

Davies et al. [25] identified differences in BPNs for autonomy and competence among participants with different weekly frequencies. Those who participated in CrossFit training less than two sessions per week presented lower levels of psychological needs compared to those who attended more than three sessions per week. Revitalization ($p < 0.05$), enjoyment, affiliation, and competition ($p < 0.01$) (items of EMI-2) were all significantly correlated with both duration and frequency of participation in CrossFit training [13]. Additionally, those who trained most frequently (more than 5 days/week) scored higher for intrinsic subscales (enjoyment, affiliation, challenge and competition) and those training 5 or less days per week showed the highest levels for extrinsic motivational components, such as weight management [14].

Age and sex comparison

The studies showed that men presented more performance-related goals in comparison to women [31]. They were more motivated by factors associated with challenge, social recognition, competition, strength, endurance and agility [13]. Additionally, women were more motivated by factors related to stress, weight control and appearance [13]. Another two studies showed that competition (as a motivational factor) was more prevalent among males than female participants [13, 32].

One study investigated the motivation among different age cohorts [30] and found that extrinsic factors such as affiliation, social recognition, and competition are factors that lead younger participants (25–32 years old) to engage in CrossFit training; they were also highly motivated by intrapersonal motives—stress management, enjoyment and

challenge. Older participants (more than 50 years old) were more strongly motivated to health and body-related motives.

Discussion

This study aimed to analyse the motivational characteristics of CrossFit training participants through a narrative review. Understanding the psychological aspects within the exercise setting, especially motivation, is important since promoting physical activity continues to be a challenge around the world. Therefore, the rapid and recent growth of CrossFit training worldwide [34] draws attention to the potential characteristics that may be different in this training modality than in other forms of exercise, explaining in part the devotion and adherence to CrossFit training of a large number of people across the world [34]. From the reviewed studies, we observed that the extrinsic locus of motivation appears in a more autonomous way in CrossFit training. Meaning that goals within the activity, such as learning new skills or accomplishing a task, seems to provide more internal experience [25] than participating in it for the benefits of improving health alone.

The majority of the studies in this review used the Self-determination Theory as the main theoretical framework, thus it is important to observe that “extrinsic” is not a pejorative term, it merely refers to the purpose of the activity; exercises are often extrinsically motivated, but these extrinsic motives vary in their relative autonomy [23]. It was observed that the majority of the external regulations to CrossFit training participation were internalized, indicating identified and integrated motivational regulations.

This review also suggests that CrossFit training participation may provide an environment where essential psychological needs are supported, such as autonomy, competence and relatedness [12, 25]. Moreover, it is observed that the provision of CrossFit participants’ satisfaction regarding the three psychological needs—autonomy, competence and relatedness—appears through promoting skills, knowledge and dispositions for successful and enjoyable participation within the environment [25]. Indeed, CrossFit training, while performed in a group setting, allows for the enhancement of relatedness by social support; the characteristics of training, such as the development of exercises performed in pairs or trios, with the establishment of common goals in the fulfilment of the tasks are the structure of the CrossFit training that favours social support and, consequently, relatedness. It seems that CrossFit affiliates have characteristics that provide the contexts through which the need to belong can be satisfied, which favour the experience with physical exercise [35]. Moreover, it seems that CrossFit training has assumed the social nature of sports environments; thereby, in these contexts, the sense of affiliation and the creation

of communities emerges as an important condition for the support of the basic psychological needs [9].

The structure provided by CrossFit training suggests a condition where the individual self-regulates the intensity level of each session, supporting autonomous behaviour [36]. Nielsen et al. [27] found that writing up the individual performance and comparing them to others was a motivating factor for some participants. These characteristics boost the competitiveness and progress of each individual [5]. CrossFit training is rooted in a constant search for improvement and is accentuated by the achievement of personal records of exercises, by increasing the load, number of repetitions within a certain time frame (AMRAP: as many rounds/repetitions as possible), or performing a certain number of repetitions in the shortest time possible [6], and allowing the individual to compare their performance with their own results and with others.

In addition to the more autonomous extrinsic locus of causality, it seems that CrossFit training comprises a high level of intrinsic motivation. It is evidenced that CrossFit participants also experience a greater sense of satisfaction and pleasure within this exercise setting. The self-determination approach supports the assumptions made by the reviewed studies, which suggest the provision of essential psychological needs within the social context are associated with promoting internal motivations [19]. For identified and intrinsic regulation in particular, the support of psychological needs addresses behaviour as a consequence of choice and volition [19]. For identified regulation, it is proposed that the individual accepts the value of the behaviour, which involves a great sense of belief and the identification of the important reasons for pursuing the behaviour. Intrinsic motivation emphasizes the behaviour motivated by the inherent reward, filled by pleasure and satisfaction [19]. This motivational locus of causality is associated with higher commitment, and a stronger and better maintained adherence in CrossFit training, compared to other training modalities [37].

Compared to others forms of high-intensity training, Fisher et al. [9] suggested an important difference from traditional training modalities, as CrossFit training takes advantage and enjoys the features of the sports, such as challenge and affiliation, which in turn promote adherence and maintenance of training. Moreover, even though an inverse relationship between exercise intensity and pleasure-related affective response exists [21], it seems that when exercise intensity is self-selected, rather than imposed, which is typically the case with CrossFit training, this aids tolerance to higher intensity levels [21].

It seems that both men and women are motivated to engage in CrossFit training by different factors [13, 14, 32]. Molanorouzi, Khoo, and Morris [38], found different reasons for sports participation between the sexes. Men were

intrinsically motivated by competition and ego and women were extrinsically motivated by the desire to improve physical appearance. However, even though the main reasons for both men and women to participate in CrossFit training were predominantly extrinsic, no differences were observed regarding the health motive [13, 32].

CrossFit training as a modality that mixes characteristics of exercise (planned, structured and repetitive) and sports (physical activities with competition) has shown a wide growth [39] in popularity and interest from researchers, the latter mainly concerned with injuries and physiological parameters [40–43]. However, the research density related to this training modality is scarce and in its early stages, as shown in this review and other study [44].

Future studies should address the motivational characteristics of people who dropped out from CrossFit as a causal relationship cannot be assumed from the present review. The motivational characteristics of those who dropped out weeks and months after initiating their first session are unknown, thus not allowing for a comprehensive understanding of the subject; nonetheless, future studies should attempt to engage these individuals to further elaborate how motivational factors differ between these two groups. Efforts should also be made to explore the extent to which CrossFit participation discourages motivation due to the competitive characteristics.

Based on the studies reviewed, the findings should be carefully analysed taking into consideration that most of the studies included were conducted with trained individuals—in most cases, with more than three months CrossFit training experience—which means they may have adapted to the psychological requirements of CrossFit training, so that those with more self-determined motivations may have persisted in the demands posed during the initial weeks of participation. Moreover, the heterogeneity of the instruments used to measure motivation makes generalizations difficult and constrains the possibility of conducting a meta-analysis of the results.

Conclusion

We observed that the motivational characteristics of participants engaged in CrossFit training rely in a way where more autonomous forms of motivation appear. Most motivations were characterized by identified, integrated and intrinsic motivational regulation; thus, CrossFit training participation may provide an environment in which essential psychological needs are supported, such as autonomy, competence and relatedness.

It seems that CrossFit training is different from other exercise modalities, whereby CrossFit training has assumed the nature of sports in the exercise setting, which in turn

may explain the internal and the relevant regulatory process of motivation, such as personal importance, consciousness, sense of volition, learning, enjoyment and pleasure. The motivational characteristics of CrossFit training may also explain the adhesion and the adherence of a large number of people in the exercise context. Such characteristics should also be explored in other forms of exercise as a strategy to promote physical activity in different populations.

Despite suggesting that the individual accepts the value of the CrossFit training, comprising a great sense of belief and identification, some forms of controlled motivation may also appear in the CrossFit setting. This issue should be a matter of concern in future studies, especially the role of introjected motivation. Efforts should also be made in future studies to explore if and how the process of internalization appears in the CrossFit setting. In addition, longitudinal approaches are needed to explore nuances in the motivational regulations of CrossFit participants.

Compliance with ethical standards

Conflict of interest No potential conflict of interest was reported by the authors.

Ethical approval This article does not contain any studies with human participants performed by any of the authors.

Informed consent For this type of study formal consent is not required.

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