PSYCHOLOGICAL CONCOMITANTS OF CROSSFIT TRAINING: DOES MORE EXERCISE REALLY MAKE YOUR EVERYDAY PSYCHOLOGICAL FUNCTIONING BETTER?

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Abstract:

The research aimed at studying relationships between characteristics of CrossFit training (time elapsed from starting with training, weekly session frequency) and indicators of well-being, self-esteem, body awareness, satisfaction with body image, and perceived body competence. Participants, 186 Norwegian individuals (57.5% female; mean age: 28.9±7.81 years) regularly participating in CrossFit, completed online surveys (*WHO-5 Well-being Scale, PANAS, Rosenberg Self-Esteem Scale, Body Awareness Questionnaire, Body Image Ideals Questionnaire, Body Competence Scale*, motivations for doing CrossFit). Weekly frequency of CrossFit sessions was not connected with positive affect (Kendall *tau_b*=-.02, p=.766), negative affect (-.01, p=.861), or well-being (.10, p=.068) in the correlation analysis. Similarly, overall CrossFit experience (duration x frequency) was not related to global self-esteem (Kendall *tau_b*=.01, p=.778), body awareness (-.04, p=.379), body image dissatisfaction (.04, p=.423), and body competence (-.07, p=.184). In the regression analysis, well-being was connected with male gender (β=-.205, p<.01), time elapsed from starting with CrossFit (β=-0.178, p<.05), dissatisfaction with body image (β=-.218, p<.01), and body awareness (β=.149, p<.05). Global self-esteem was related to age (β=.164, p<.05), body competence (β=.152, p<.05), and body image dissatisfaction (β=-.276, p<.001). CrossFit training was not connected with higher levels of psychological functioning (well-being, affect, body awareness, and self-esteem) and satisfaction with body image.

***Key words**: crossfit, well-being, self-esteem, body awareness, body image, body competence*

Introduction

Physical exercise and psychological functioning

Beyond lack of psychopathology (e.g. depression, anxiety), healthy psychological functioning is usually characterised by low levels of negative affect and high levels of positive affect, subjective (or emotional) well-being, and self-esteem. Physical exercise was found to positively contribute to all of the aforementioned factors (Hassmén, Koivula, & Uutela, 2000; Lox, Martin Ginis, & Petruzello, 2010; McAuley, 1994; Scully, Kremer, Meade, Graham, & Dudgeon, 1998). Although regular exercise has been shown to improve well-being and mood state (Fox, 1999; Hassmén, et al., 2000; Lox, et al., 2010; Magnan, Kwan, & Bryan, 2013; McDonald & Hodgdon, 1991; Penedo & Dahn, 2005), the relationship between exercise and well-being is more complex. First, the impact on well-being and mood is a function of intensity and duration of exercise implying a dose-response relationship and an individual "exercise dosage" that can optimally improve well-being (Ekkekakis & Petruzzello, 1999; Lox, et al., 2010). For example, the lactate threshold (or the closely correlated respiratory threshold) has been suggested as an important hallmark between pleasure and displeasure during exercise, which may also influence subsequent mood states (Ekkekakis, Hall, & Petruzzello, 2008; Ekkekakis, Parfitt, & Petruzzello, 2011). Second, overtraining and the following staleness syndrome can result in worse mental health or even clinical depression (Lox, et al., 2010; Paluska & Schwenk, 2000; Raglin & Moger, 1999). Third, the phenomenon of exercise addiction (also called obligatory exercise or exercise dependence) has been shown to deteriorate mental health and lead to withdrawal symptoms, depression, and anxiety (Hausenblas & Symons Downs, 2002; Symons Downs, Hausenblas, & Nigg, 2004; Szabo, 2010).

Body awareness is a mental representation of one's own body, based almost exclusively on internal (i.e. proprioceptive and visceroceptive) information (Mehling, et al., 2009). Body awareness is regarded as a core component of self-concept and it is connected with positive affect, well-being, and everyday functioning (Ainley & Tsakiris, 2013; Bechara & Naqvi, 2004; Brani, Hefferon, Lomas, Ivtzan, & Painter, 2014; Damasio, 2003; Impett, Daubenmier, & Hirschman, 2006; Pollatos, Kirsch, & Schandry, 2005; Sági, Szekeres, & Köteles, 2012). Although regular physical activity might improve body awareness (Mehling, et al., 2009; Sági, et al., 2012; Tihanyi, Sági, Csala, Tolnai, & Köteles, 2016), the construct is rarely investigated or even mentioned in the context of exercise psychology.

Self-esteem and physical activity

The connection between self-esteem (i.e. the evaluative consequence of one's self-concept) and regular physical activity is also well documented (Fox, Biddle, & Boutcher, 2000; Lox, et al., 2010; McAuley, 1994; Schmalz, Deane, Birch, & Davison, 2007; Scully, et al., 1998; Sonstroem, 1997). Although many sub-domains of self-esteem have been described, possibly the most important aspect is global self-esteem, as it plays a primary role in everyday human functioning; low self-esteem introduces biases in the interpretation of life events, decreases psychological well-being, and can cause maladaptive and/or compensatory behaviour (Johnson & Blom, 2007). Physical activity can impact self-esteem in multiple ways, in which physical competence-related and body image-related factors are usually emphasized (Haugen, Säfvenbom, & Ommundsen, 2011; Scully, et al., 1998).

A complex approach that tries to explain factors connected with physical competence is the model suggested by Sonstroem and Morgan (1989). According to this model, self-esteem is influenced mainly by physical competence (determined by physical performance and self-efficacy) and acceptance of one's physical competence (Sonstroem & Morgan, 1989). It is important to emphasize that all of these factors are subjective (perceived) (Lox, et al., 2010), in other words, the role of personal evaluation (e.g. based on social comparison or expectations) is much more important than objective measures of performance.

The other factor that heavily influences global self-esteem is body image (McAuley, 1994; Scully, et al., 1998), another mental representation of the body that relies mainly on the visual dimension and social comparison (i.e. a third person's view of the body). Although it is also conceptualized as a multidimensional construct having perceptual, cognitive, affective, and behavioural dimensions (Lox, et al., 2010), self-esteem is primarily related to its evaluative (or emotional) aspect (i.e. satisfaction with one's body), which is sometimes also called body esteem (MacKinnon, et al., 2003; Shavelson, Hubner, & Stanton, 1976).

CrossFit

As previously mentioned, the impact of physical activity on well-being and healthy functioning depends on exercise intensity and frequency because higher doses of exercise can lead to negative psychological consequences. These effects are well-known from studies conducted with elite competitive athletes (Lox, et al., 2010; Raglin & Moger, 1999; Szabo, 2010). Physical fitness has recently become an important part of our modern culture, and regular physical activity is also encouraged by medical professionals when promoting health. In consequence, more and more individuals engage in physical activity in their leisure time. However, this does not necessarily equal low or moderate intensity or frequency in the case of many modern popular sports (CrossFit, Kettleball, etc.). Participants of these sports are often highly motivated and spend considerable time with their training activity that is often regarded as a lifestyle rather than a separate activity. The scientific literature of the psychological aspects of these modern sports is scarce; it is unknown whether these physical activities are associated with positive or negative psychological states of participants. In the current research, psychological correlates of a typical modern sport, CrossFit, were investigated.

CrossFit is an increasingly popular sport, aiming at forging broad, general, and inclusive fitness that would best prepare trainees for any physical contingency (Hak, Hodzovic, & Hickey, 2013; Partridge, Knapp, & Massengale, 2014). CrossFit was designed by its founder Greg Glassman to enhance a wide array of physical characteristics simultaneously, such as cardiovascular endurance, power, flexibility, speed, agility, and balance (Glassman, 2011). CrossFit is therefore aerobic and anaerobic in its nature, since it involves both prolonged and intense and brief activities of large muscle groups (Paine, Uptgraft, & Wylie, 2010). CrossFit workout 'Cindy' was found to meet the criteria of "vigorous intensity" according to the established American College of Sports Medicine HR_{max} guidelines (Kliszczewicz, Snarr, & Esco, 2014). CrossFit-based high intensity power training significantly improved maximum aerobic capacity and decreased body fat percentage in a 10-week experimental study (Smith, Sommer, Starkoff, & Devor, 2013). In another, eight-week study, CrossFit training significantly increased work capacity and was recommended for U.S. Army soldiers (Paine, et al., 2010). In the same vein, kettlebell swings that are also used in CrossFit training were found to improve cardiorespiratory fitness of athletes (Farrar, Mayhew, & Koch,

2010). According to these empirical results, CrossFit has a potential to considerably improve physical performance even for above-average athletes. Similarly, a modified version (CrossFit Teens™) was found to improve health-related fittness in adolescents (Eather, Morgan, & Lubans, 2015). In the current research, however, psychological aspects of a regular CrossFit exercise were investigated. The only academic research that the authors are aware of in this area describes motivational background of CrossFit training (Partridge, et al., 2014). According to the results of that study, there are well-defined gender differences in the motivation for CrossFit exercise: males had higher levels of performance-related goals, while females reported more mastery-based goals. Moreover, shorter membership times were associated with more mastery-related goals.

The current study aimed at exploring a much wider spectrum of psychological correlates of CrossFit training. It was hypothesized that a higher frequency of CrossFit training sessions leads to higher levels of positive affect and psychological well-being and to lower levels of negative affect. We also expected that regular long-term CrossFit exercise is related to higher levels of body awareness, body image satisfaction, body competence, and global self-esteem. Additionally, we were curious about people's motives for starting and persevering with CrossFit training.

Methods

Participants

The convenience sample was collected through Norwegian CrossFit clubs. Altogether twenty eight training clubs associated with CrossFit were contacted per email with information about the study and an inquiry of help to find participants. Out of these, seven clubs posted an advertisement (provided by the researchers) on their internet site or forum. Additionally, 33 forums, clubs, and blogs associated with CrossFit were contacted through Facebook, and an advertising text with a link to the online survey form was posted on the respective sites. The survey was written in English. All participants filled out the questionnaires voluntarily and anonymously, and did not receive any financial or other reward for their contribution. Overall, 212 questionnaires were received, out of which altogether 26 were removed due to respondents were underaged (under 18 years, 3 individuals), data were uninterpretable (22 individuals), or the requirement of doing CrossFit was not fulfilled (1 person). Finally, data of 186 participants (57.5% female; mean age: 28.9±7.81 years) were used in the statistical analysis.

Questionnaires and questions

WHO-Five Well-being Index (WHO-5) (Heun, Burkart, Maier, & Bech, 1999). The WHO-5 is a valid and reliable five-item scale assessing the degree of psychological well-being over the past two weeks on a 6-point Likert scale. Higher scores indicate higher levels of well-being. Cronbach's alpha coefficient was .81 in the present study.

Positive and Negative Affect Schedule (PANAS) (Watson, Clark, & Tellegen, 1988). The PANAS measures positive and negative emotional states as independent dimensions on a 5-point Likert scale. Higher scores indicate higher levels of positive and negative affectivity. In the present study, the short 10-item version was used (Thompson, 2007). Participants were asked to rate the statements with respect to the last four weeks. Internal consistency of the positive and negative affect scales was .65 and .79, respectively.

Rosenberg Self-Esteem Scale (RSES) (Rosenberg, 1965). The RSES is a ten-item scale that assesses global self-esteem with items rated on a 4-point Likert scale. The higher the score, the higher self-esteem the individual is assumed to have. The Cronbach's alpha coefficient for the RSES was .88 in the current study.

The *Body Image Ideals Questionnaire* (BIQ) was developed by Cash and Szymanski (1995). The BIQ measures discrepancy between actual and ideal body image. The strength of the discrepancy will vary as a function of the importance subjectively attributed to physical ideals. The BIQ asks two questions with regard to each of 11 physical characteristics, including muscle tone, hair texture, complexion, and various physical abilities (i.e. coordination, strength). Responses are indicated on a 4-point Likert scale. The first question, or part A, asks participants to what extent they feel that they match their physical ideals. The second question, or part B, asks how important it is to the participant that their actual attributes match their ideals. Higher scores on the BIQ indicate a greater discrepancy between the actual self and ideal self (i.e. higher dissatisfaction with one's own body) with a strong sense of importance placed on matching one's physical ideals (Cash, 2000). The BIQ showed an acceptable internal consistency (Cronbach's alpha=.74) in the current study.

The *Body Awareness Questionnaire* (BAQ) (Shields, Mallory, & Simon, 1989) is considered a reliable and valid instrument for measuring self-reported attentiveness to bodily processes (Mehling, et al., 2009). The BAQ consists of 18 statements that measure beliefs about one's sensitivity to normal (i.e. non-emotive and non-pathological) bodily functions and the ability to anticipate

bodily reactions. Items are answered on a 7-point Likert scale; higher scores indicate higher levels of perceived awareness of bodily processes. Cronbach's alpha coefficient for the BAQ was .82 in the current study.

The *Body Competence Scale* (BC) was developed by Miller and colleagues as part of the Body Consciousness Questionnaire (Miller, Murphy, & Buss, 1981). The scale consists of four evaluative statements on various physical abilities (strength, coordination, lightness, and speed) rated on a 5-point Likert scale. Higher total scores refer to higher levels of perceived physical competence. Internal consistency of the scale was good (.75) in the current study.

Exercise-related questions

Beyond demographic variables (gender and age), participants were asked to answer four questions that focused on their exercise-related habits. The questions concerned time elapsed from starting with CrossFit (in months), weekly frequency of CrossFit training, kinds of other regular physical exercises, and hours spent in other exercises in a week. An open question about main motivations for doing CrossFit exercise was also included.

Statistical analysis

Statistical analysis was conducted using the SPSS v20 software (IBM, Armonk, NY). WHO-5, PANAS, BAQ, RSES, and BC total scores were calculated by summarizing all item scores (appropriate item scores were reversed). In the case of BIQ, discrepancy (Item A) ratings were recoded (from 0 to -1, all other values remained unchanged), before a mean of the item-by-item cross-products of discrepancy and importance ratings was calculated as it has been described in the manual of the questionnaire (Cash, 2000). To characterize overall CrossFit experience, time elapsed from starting with practicing it and weekly frequency of practice were centered (i.e. means were substracted from individual total scores) and an interaction term (a product of the two centered variables) was calculated for each individual following the method recommended by Cohen and colleagues (Cohen, Cohen, Aiken, & West, 2003). As all CrossFit-related variables showed a significant deviation from normal distribution, correlation analysis was carried out using a non-parametric method (Kendall's *tau_b*). Finally, two multiple linear regression analyses were conducted. In the first analysis with well-being as the criterion variable, demographic (age in years; gender: 0 = males, 1 = females) and exercise-related (duration and weekly frequency of CrossFit exercise, overall CrossFit experience, and hours spent in other exercises in a week) variables were entered. In the second step, BIQ, BAQ, and BC scores were stepped in. In the second analysis, with Rosenberg's self-esteem as the criterion variable, demographic control variables and hours spent on other exercises in a week were entered in Step 1, CrossFit-related variables were stepped in Step 2, and BIQ, BAQ, and BC scores were included in Step 3.

Results

Motivations

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%).

Descriptive statistics and correlations

Descriptive statistics of the measured variables were presented in Table 1. According to the results of the correlation analysis, weekly frequency of CrossFit exercise was not connected with positive affect (Kendall *tau_b*=-.02, p=.766), negative affect (-.01, p=.861), or well-being (.10, p=.068). Similarly, overall CrossFit experience (duration x frequency) was not related to global self-esteem (Kendall *tau_b*=.01, p=.778), body awareness (-.04, p=.379), body image dissatisfaction (.04, p=.423), or body competence (-.07, p=.184).

Regression analyses

In the first step of the first regression analysis, gender (males showed higher levels of well-being) and weekly frequency of CrossFit exercise were significantly associated with well-being. In the second

Table 1. Descriptive statistics of the assessed variables

	M±SD
Duration of CrossFit exercise (months)	16.34±15.028
Weekly frequency of CrossFit exercise	5.43±3.592
Overall CrossFit experience (duration x frequency)	1.80±50.402
Time spent with other exercises (hours/week)	3.15±3.033
Well-being (WHO-5)	18.54±3.484
Global Self-Esteem (RSES)	31.83±5.448
Positive Affect (PANAS)	18.40±3.062
Negative Affect (PANAS)	9.71±3.935
Body Image Dissatisfaction (BIQ)	1.37±1.060
Body Awareness (BAQ)	83.60±14.767
Body Competence (BC)	13.90±3.076

Table 2. Results of the multiple linear regression analysis with well-being as a criterion variable

	Step 1, R^2=.085, p<.05		Step 2, R^2=.185, p<.001	
	B±SE	β	B±SE	β
Gender	-1.249±0.523	-.177*	-1.445±0.518	-.205**
Age	0.035±0.034	.079	0.026±0.033	.058
Other exercises	0.073±0.084	.063	0.042±0.081	.036
CrossFit exercise duration	-0.022±0.017	-.096	-0.041±0.017	-.178*
Weekly frequency	0.173±0.077	.178*	0.095±0.075	.098
CrossFit experience	0.007±0.005	.100	0.005±0.005	.077
Body image dissatisfaction			-0.729±0.249	-.218**
Body awareness			0.035±0.017	.149*
Body competence			0.152±0.083	.134

Note: *: p<.05; **: p<.01

Table 3. Results of the multiple linear regression analysis with global self-esteem as a criterion variable

	Step 1, R^2=.074, p<.01		Step 2, R^2=.103, p<.01		Step 3, R^2=.214, p<.001	
	B±SE	β	B±SE	β	B±SE	β
Gender	-2.231±0.787	-.204**	-1.800±0.805	-.164*	-1.520±0.791	-.139
Age	0.112±0.050	.162	0.137±0.053	.197*	0.114±0.050	.164*
Other exercises	0.007±0.128	.004	-0.001±0.129	-.001	0.012±0.124	.007
CrossFit exercise duration			0.040±0.026	.112	0.016±0.025	.044
Weekly frequency			0.207±0.118	.137	0.090±0.115	.059
CrossFit experience			0.007±0.008	.067	0.007±0.007	.065
Body awareness					-0.015±0.027	-.040
Body competence					0.268±0.127	.152*
Body image dissatisfaction					-1.435±0.381	-.276***

Note: *: p < 0.05; **: p < 0.01; ***: p < 0.001

step, well-being was connected with gender, time elapsed from starting with CrossFit (reverse direction), body image dissatisfaction (reverse direction), and body awareness (Table 2).

In the second regression analysis, global self-esteem was related to gender (with males having higher levels of self-esteem) and age in the first two steps, while CrossFit-related variables and intensity of other body exercises showed no significant connection. In the third step, age, body competence, and body image dissatisfaction (in the reverse direction) were connected with self-esteem (Table 3).

Discussion and conclusions

In our cross-sectional questionnaire study, CrossFit training was not associated with indicators of well-being, global self-esteem, body awareness, satisfaction with body image, or perceived body competence in the correlation analysis. According to the regression analysis, higher levels of well-being were connected with the male sex, shorter time elapsed from starting with CrossFit training, higher levels of body awareness, and higher satisfaction with one's body. Finally, global self-esteem was related to age, perceived body competence, and higher levels of body satisfaction but not to CrossFit-related variables.

The only study exploring the motivational background of CrossFit training (Partridge, et al., 2014) focused on motives connected with physical abilities (i.e. performance and self-improvement related goals). In the current research, a wider spectrum of motives was mentioned by the participants, from weight management and attractiveness to physical and mental aspects of healthy functioning. This discrepancy can be explained by the measures used; in the study of Partridge and colleagues, a questionnaire developed to assess motives behind physical improvement (Perceived Motivational Climate in Sport Questionnaire) was applied, which necessarily limited the spectrum of the results. Moreover, the questionnaire was completed directly after a workout, when the effect of situational cues could

be considerable. In the present study, however, motives were assessed using an open end question with respondents positioned in front of a computer, which encouraged reporting of long-term, more general motives.

In the exploratory part of the study, the most often mentioned motives for regular CrossFit training were improving fitness and health. As for fitness, empirical results are in accordance with the expectations and experiences of CrossFit enthusiasts (Farrar, et al., 2010; Paine, et al., 2010; Smith, et al., 2013). Regarding the expected preventive and/or health preservation effects, however, direct (i.e. CrossFit-related) evidence is not known to date. Although regular physical exercise is usually considered beneficial for health, it is known that vigorous training can have its own harmful effects in the long run. For example, the risk of atrial fibrillation was found to be significantly higher in athletes (particularly in the case of vigorous endurance exercise) compared with non-athletes (Abdulla & Nielsen, 2009; Aizer, et al., 2009; Delise, Sitta, & Berton, 2012). Similarly, prevalence of asthma and bronchial hyperresponsiveness is markedly increased in athletes, especially within vigorous endurance sports (Carlsen, et al., 2008). Adverse metabolic responses to intense physical activity (e.g. worsening cardiovascular and diabetes risk factors) have also been reported (Bouchard, et al., 2012). In summary, positive health-related effects of regular physical exercise appear to be dose-dependent (Drca, Wolk, Jensen-Urstad, & Larsson, 2014; Guasch & Mont, 2014; Mons, Hahmann, & Brenner, 2014); maximum cardiovascular benefits are obtained if performed at moderate doses where the optimal dose is a function of age (Shephard, 1997), while these effects are lost with high-intensity and prolonged efforts. Similarly, intensive training may lead to joint dysfunctions and arthritis (Gross & Marti, 1997; Knobloch, Marti, Biedert, & Howald, 1990; Timm, 1999; Valderrabano, et al., 2006), while lower levels of exercise have no such negative effects (Hunter & Eckstein, 2009; Roos, 1998). As CrossFit training can be very intense physical exercise repeated 5-6 times a week in the current sample, the previously mentioned negative effects cannot be excluded. Possible injuries during CrossFit training also represent a risk factor (Bergeron, et al., 2011; Joondeph & Joondeph, 2013), although this does not seem to be higher than in similar sports (Olympic weight-lifting, power-lifting and gymnastics) (Hak, et al., 2013). This is not to say that doing CrossFit is a harmful practice as beneficial effects may offset supposed risks. However, based on our current knowledge, it is safe to state that there might be more optimal ways to maintain a good health status or to prevent diseases, thus the health-related motivations behind CrossFit training seem to be less realistic.

Well-being and joy were mentioned as motives behind CrossFit training by 23.1% and 12.4% of participants, respectively. According to the present results, however, higher weekly frequency of CrossFit training was not related to a better psychological state (i.e. higher levels of well-being and positive affect, or lower levels of negative affect). Moreover, duration of the practice (i.e. time elapsed from starting with CrossFit) was negatively connected with well-being. Similarly, characteristics of CrossFit practice were not connected to the other indicator of good psychological functioning – global self-esteem. To explain these findings, one has to keep in mind that acute and chronic affective responses to physical activity are also dose-dependent (Ekkekakis, et al., 2008, 2011; Ekkekakis & Petruzzello, 1999; Lox, et al., 2010), where high doses are connected with lower levels of pleasure. CrossFit training (perhaps because of its very high intensity and weekly frequency) does not seem to be the optimal way to improve psychological functioning.

Weight management, attractiveness, and improved functional skills were mentioned as motives by 10.2%, 13.4%, and 36.6% of CrossFit enthusiasts, respectively. However, overall CrossFit experience was correlated neither with the satisfaction with one's body nor with body competence. One has to consider, however, that both variables are perceived (i.e. subjective) and subject to change based on the person's actual state and abilities. Expectations and evaluations are usually gradually shifted toward higher levels over time, particularly in the highly motivating milieu that characterizes CrossFit training (Partridge, et al., 2014).

The current findings obtained from a special sample support the often described connection between well-being and body image satisfaction (Borges, Gaspar de Matos, & Diniz, 2013; Cash & Deagle, 1997; Delfabbro, Winefield, Anderson, Hammarström, & Winefield, 2011; Thompson, Heinberg, & Tantleff-Dunn, 1999). The relationship between well-being and body-awareness, however, has received less attention in the past. From a theoretical point of view, awareness of body signals leads to a more intense sense of self (Bakal, 1999; Brown & Ryan, 2003; Fogel, 2009; Impett, et al., 2006) and facilitates autonomous decision making (Damasio, 1994, 2003), and both of these factors are closely connected with subjective well-being. Moreover, the connection between mindfulness and well-being has also been described (Brown, Poliakoff, & Kirkman, 2007; Keune & Perczel Forintos, 2010), and body awareness can be regarded as a facet of mindfulness (Hölzel, et al., 2011; Mehling, et al., 2009). Finally, direct empirical findings supporting the existence of the connection between well-being and body awareness are also known (Brani, et al., 2014; Tihanyi, et al., 2016). Our results represent a valuable contribution to this empirical literature.

After controlling for age, gender, and exercise-related habits in the regression analysis, self-esteem was related to satisfaction with body image and to perceived body competence. This result is also in accordance with previous empirical findings (Fox, et al., 2000; Lox, et al., 2010; McAuley, 1994; Schmalz, et al., 2007; Scully, et al., 1998; Sonstroem, 1997), and supports the concept that physical competence and external appearance are important factors in the development and maintenance of self-esteem (Haugen, et al., 2011; Scully, et al., 1998).

As the sample of the current study was not representative of the CrossFit community, the results should be interpreted with caution. A further limitation of the study is that the survey form was administered online, which means that various environmental factors during filling out the questionnaires were not under control. Empirical results show, however, that there are usually no substantial differences between results obtained by paper-and-pencil and web-based administrations (Davis, 1999; Stanton, 1998). Moreover, as a cross-sectional approach was used, directions of causality could not be determined. Finally, including a questionnaire that measures exercise addition may have been helpful in the interpretation of relationships between indicators of well-being and characteristics of CrossFit training.

Contrary to the expectations of enthusiasts, frequency of CrossFit training was not connected with higher levels of psychological functioning (well-being, affect, body awareness, and self-esteem) and satisfaction with one's body. In accordance with previous empirical findings, body awareness and body image satisfaction were important contributors to subjective well-being, and global self-esteem was connected with body image satisfaction and perceived body competence.

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