

Original Article

Examining the influence of CrossFit participation on body image, self-esteem, and eating behaviours among women

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Abstract

The purpose of this study was to investigate the associations between CrossFit variables (i.e., skill, length, and frequency) and women's body image (i.e., overall and evaluative dimension), self-esteem, and eating behaviours. The study also sought to uncover women's motivations for participating in CrossFit and reasons for choosing to participate in CrossFit over other exercise environments. Women from five CrossFit affiliates ($N = 149$, mean age of participants was 34.95 years, $SD = 9.16$) completed surveys composed of both open- and closed-ended questions. Four multiple linear regressions revealed that CrossFit skill was positively associated with overall body image, $F(3, 145) = 8.269, p < .001$, and evaluative body image, $F(3, 145) = 8.487, p < .001$, CrossFit length (i.e., number of months participants have engaged in CrossFit) was negatively associated with disordered eating, $F(3, 145) = 3.530, p = .017$, and no CrossFit variables were associated with global self-esteem, $F(3, 145) = 2.562, p < .057$. Although some differing experiences were reported among women, improving/maintaining physical abilities, challenge, community, and mental health were the most commonly mentioned motivations. Other motivations included for aesthetics/weight management, the presence of programming, and to act as a role model. Thematic analysis also revealed that women chose the CrossFit environment over other exercise environments for its community, sense of inclusion, programming, and challenge. This study provides initial evidence of associations between CrossFit participation and women's body image and eating behaviours. Although no associations with self-esteem were reported, future research should investigate whether or not specific domains of self-esteem are associated with participation.

Key words: Exercise, Psychosocial Health, Exercise Environment, Motivation

Introduction

The Canadian Society for Exercise Physiology (CSEP; 2019) suggests that adults should accrue a minimum of 150 minutes of aerobic physical activity a week, as well as muscle and bone strengthening activities twice per week to achieve health benefits. These health benefits not only include reducing the risk of various diseases (e.g., heart disease, stroke, obesity; CSEP, 2019), but may also lead to improvements in psychosocial health (CSEP, 2019). Psychosocial health is a multidimensional concept that includes the mental, emotional, social, and spiritual aspects of an individual's health, including an individual's body image, self-esteem, and eating behaviours (Donatelle, 2011).

Body image is a multi-faceted construct that relates to the attitudes an individual has towards their physical self that includes cognitive, behavioural, and evaluative components (Cash & Pruzinsky, 2002). Silberstein, Striegel-Moore, Timko, and Rodin (1988) propose that body dissatisfaction tends to occur as a result of identifying a discrepancy between the self-perceived body (i.e., body image) and that which is perceived to be ideal. Conversely, self-esteem, another component of psychosocial health, is highly correlated with body image (Mellor, Fuller-Tyszkiewicz, McCabe, & Ricciardelli, 2010) and can be defined as the attitudes an individual has toward themselves as a whole (Rosenberg, 1965). Moreover, an individual's evaluation of their physical and overall self (i.e., body image and self-esteem) can influence other health practices, such as their eating behaviours (Braun, Park, & Gorin, 2016), which include food choices and motives behind these choices and feeding practices (e.g., dieting; LaCaille, 2013). Specifically, unhealthy eating behaviours may include: binge eating, calorie counting, dieting, and/or restrictive eating, among others (National Eating Disorder Collaboration, 2018). In addition, women tend to experience poorer psychosocial health [i.e., greater body dissatisfaction (Ålgars et al., 2009), lower self-esteem (Bleidorn et al., 2016), and more instances of disordered eating (Holland & Tiggermann, 2016)] than men.

Yet, despite the known benefits of exercise for a women's psychosocial health (Campbell & Hausenblas, 2009; Joo, Williamson, Vasquez, Fernandez, & Bray, 2019; Spence, McGannon, & Poon, 2005), only 17% of Canadian adults currently meet the physical activity recommendations, women significantly less men (Statistics Canada, 2019). As such, many researchers have begun investigating the underlying reasons why women may choose to (or not to) engage in exercise (i.e., their motivations), with an emphasis on the examining the impact

specific exercise environments may have on women's body image, self-esteem, and eating behaviours (Clark, 2017; Prichard & Tiggemann, 2008). Such previous research is not without theoretical support. The socio-ecological model, developed by Bronfenbrenner (1974), suggests that dynamic interactions exist between humans and their environment. The model is composed of five levels that make up the characteristics (e.g., their body image, self-esteem, and eating behaviours) of the individual and their personal relationships (individual and interpersonal levels), as well as the physical environment (organizational, community, and public policy levels; Bronfenbrenner, 1974). Thus, the socio-ecological model, and its levels, can be used to help understand human development, including all aspects of an individual's health.

Specifically, the dynamic interactions occurring between individuals (i.e., lower levels of the model) and the CrossFit exercise environment (i.e., higher levels of the model) are receiving much attention as of late are CrossFit gyms (i.e., affiliates; Baştuğ, Özcan, Gültekin, & Günay, 2016; Podmore & Ogle, 2018). CrossFit is an exercise program aimed at combining high intensity aerobic exercises (e.g., running, biking), with skill-based exercises (e.g., gymnastics), strength-based exercises (e.g., weightlifting), and mobility work (e.g., flexibility exercises) to improve an individual's physical and psychosocial health (Glassman, 2002). In addition, through the use of group-based classes, CrossFit workouts are aimed at creating social networks and communities that encourage comradery and friendship among members (CrossFit, 2018). Yet, due to its relative novelty, research examining potential associations between CrossFit and women members' psychosocial health is somewhat limited, with a larger body of qualitative than quantitative or mixed studies being published.

Specifically, body image research by Baştuğ et al. (2016) suggested that women's satisfaction with various areas of their body significantly increased after participating in a 12-week mixed-exercise program (including CrossFit, Pilates, and Zumba). Conversely, Eather, Morgan, and Lubans (2016) perceived no changes to perceived appearance (i.e., body image) among adolescent girls (mean age: 15 years) using an 8-week CrossFit-based resistance program. Similarly, Köteles, Kollsete, and Kollsete (2016) also reported no association between CrossFit participation and body satisfaction among women. However, qualitative studies of CrossFit affiliates may provide more insight into the potential influence of the CrossFit environment on women's body image (Knapp, 2015; Podmore & Ogle, 2018). For some women, CrossFit affiliates created an environment that emphasized the body's function over its appearance (Podmore & Ogle, 2018), with women describing becoming less invested in their appearance and more confident in their bodies as a result (Podmore & Ogle, 2018). In addition, the CrossFit environment has been reported to disrupt traditional femininity ideals by encouraging women to embrace strong, athletic, muscular bodies (Knapp, 2015; Podmore & Ogle, 2018). This discovery is caveated by Podmore & Ogle (2018) who highlighted that despite the disruption to traditional femininity and thinness, the presence of a muscular-ideal can still lead to body dissatisfaction for women who are not achieving this ideal.

To the authors' best knowledge, when examining the influence of CrossFit participation on women's self-esteem, quantitative evaluations are limited, with no significant associations reported to date (Eather et al., 2016; Köteles et al., 2016). However, using a qualitative approach, Simpson, Prewitt-White, Feito, Giusti, and Ryan Shuda (2017) noted that participants who engaged in CrossFit experienced transformation in their self-esteem. Specifically, participants perceived an increase in confidence and a more positive approach to life since starting CrossFit, as well as higher self-esteem regarding their ability to overcome obstacles both in and outside of their affiliate (Simpson et al., 2017). Similarly, Podmore and Ogle (2018) suggested that women experienced an increase in their confidence and self-esteem, both during workouts and in other aspects of their lives (e.g., at work), as a result of their CrossFit participation. However, Podmore and Ogle (2018) also noted that CrossFit negatively impacted the self-esteem and confidence of a small number of women who felt pressured to meet the physical demands of CrossFit or who felt as though coaches/other members were gazing at them.

Lastly, even fewer studies have examined associations between CrossFit participation and women's eating behaviours. Specifically, to the authors' knowledge, no quantitative studies have examined such associations. Yet, qualitative research by Edmonds (2019) and Simpson and colleagues (2017) suggested that many women adopted specific diets (e.g., Zone or Paleo diet) that required limiting/removing certain foods, upon joining CrossFit. However, women appeared to be doing so for performance, not appearance-related reasons (Edmonds, 2019; Simpson et al., 2017). Additionally, the literature suggests that although some women attending CrossFit felt pressured to adopt specific eating behaviours, such as eating "clean" (i.e., whole foods and avoiding processed foods), others reported adopting a more relaxed approach (Edmonds, 2019; Podmore & Ogle, 2018; Simpson et al., 2017).

Thus, as with any relatively new area of study, gaps in the literature still exist. First, despite reciprocal relationships existing between all three psychosocial variables (Braun, Park, & Gorin, 2016; Furnham, Badmin, & Sneade, 2002; Mellor et al., 2010) and with exercise (Zamani Sani et al., 2016), no study has yet to investigate the impact of all three psychosocial variables and women's CrossFit participation. Second, although some qualitative research regarding associations between women's eating behaviours and CrossFit participation exists, a lack of quantitative research is evident, limiting the generalizability of results. Thirdly, although the presence of a dose-response relationship may exist between exercise intensity, exercise duration, and aspects of psychosocial health (e.g., well-being and mood; Lox, Martin Ginis, & Petruzello, 2010), research examining whether this relationship exists between CrossFit and body image, self-esteem, and or eating behaviours is

almost nonexistent (Köteles et al., 2016). Similarly, despite extensive research linking sport/exercise competence with aspects of psychosocial health such self-esteem (Papaioannou & Hackfort, 2014), such associations with CrossFit-based exercise have, to the authors knowledge, yet to be determined.

Moreover, although research regarding the influence of women's CrossFit participation on psychosocial health is still in its infancy, a few studies have begun to examining individuals' motivations for participating in CrossFit, with many individuals suggesting psychosocial related motivations such as well-being and body image related factors (Köteles et al., 2016; Partridge, Knapp, & Massengale, 2014). As such, the purpose of this study was to quantitatively investigate the associations between three CrossFit participation variables (i.e., skill, length, and frequency) and women's body image, self-esteem, and eating behaviours. In addition, this study sought to qualitatively examine participants motivations for engaging in CrossFit and identify unique aspects of the CrossFit environment to better understand the quantitative findings.

Methods

Procedures

University of Windsor Ethics Board clearance was obtained, and five CrossFit affiliates were recruited via email to participate in the study. All five CrossFit affiliates agreed to participate. Each respective owner was then asked to send out a mass-email, and four reminder emails, that provided information regarding the study, including the survey link, to all members. The five CrossFit affiliates were located in Southwestern Ontario, Canada in two midsized cities. The larger of the two cities has a population of 233, 763 and the other has a population of 105, 529. Data obtained from the five owners suggested a total potential sample of approximately 400 women.

Participation was voluntary and anonymous, with informed consent obtained at the survey's onset. Surveys were completed electronically via Qualtrics (2019) at participants' convenience and took 30 minutes to complete. Participants first answered basic demographic questions, followed by open-ended questions, and then close ended questions, in a non-randomized order. Upon survey completion, participants could enter their name and an email address, using a separate survey, for a chance to win a prize package.

Participants

Upon the removal of incomplete surveys ($n = 51$), the surveys of 149 women were used for statistical analysis. The mean age of participants was 34.95 years ($SD = 9.16$), with the youngest participant aged 19 years and the eldest participant aged 61 years. Affiliate response rates ranged between 31-39% based on the total number of women registered at each affiliate, respectively.

Quantitative Measures

Demographic variables.

Age. Participants were asked "What month were you born?" and "What year were you born" in order to create the continuous variable of age, measured in years. This variable was included as it may be associated with psychosocial health variables (Tiggemann & McCourt, 2013; Trzesniewski, Donnellan, & Robins, 2003)).

Independent variables.

CrossFit length. To create a continuous variable based on the number of months each participant has engaged in CrossFit, participants were asked "How many months have you been engaging in CrossFit?"

CrossFit frequency. Participants were asked, "On average, since starting CrossFit, how many days a week do you attend CrossFit?". A continuous variable was created based on the average number of days per week they attended CrossFit with scores ranging from 0-7. Two separate attendance related variables were created (CrossFit length and frequency) as some participants may be long time members but not attend frequently, while others may be newer but attend more often.

CrossFit skill level. Participants were asked to self-identify their CrossFit skill level, which were based upon one of the affiliates categorization of scaling options for workouts (i.e., level of difficulty within the workout). The four skill level categories created were: beginner (i.e., still learning the fundamental movements), intermediate (i.e., able to perform all the fundamental CrossFit movements but do not perform all workouts as prescribed), advanced (i.e., able to perform all the fundamental and most advanced CrossFit movements and perform most workouts as prescribed), and competitive (i.e., able to perform all fundamental and advanced CrossFit movements and perform all workouts as prescribed).

Dependent variables.

Multidimensional Body-Self Relations Questionnaire: Body Areas Satisfaction Scale (MBSRQ-BASS). The MBSRQ-BASS is a 9-item subscale of the larger 69-item self-report inventory, that assesses the evaluative, cognitive, and behavioural components of body image (Cash, 2018). It is assessed on a 5-point rating scale ranging from 1 (*very dissatisfied*) to 5 (*very satisfied*) and scored based on the mean of its corresponding items. A sample item is: "Use this 1 to 5 scale to indicate how dissatisfied or satisfied you are with each of the following areas or aspects of your body: Weight". High scores indicate greater content with most areas of their body, whereas low scores represent the reverse. Evidence of both reliability, Cronbach's alpha internal consistency average value of .73 for women, and validity, numerous studies reporting the score-valid evidence, exist (Cash, 2018). In the current study, Cronbach's alpha coefficient was .79.

Body Image Ideals Questionnaire (BIQ). The BIQ assesses evaluative body image by measuring the degree of discrepancy between self-perceived and ideal physical attributes (Part A) and the self-rated importance of each of the eleven physical attributes (Part B). Attributes measured include height, skin complexion, muscle tone and definition, among others. Responses are on a 4-point rating scale that range from 0 (*exactly as I am*) to 3 (*very unlike me*) for Part A, and from 0 (*not important*) to 3 (*very important*) for Part B. A sample item is: “A. My ideal body proportions are:” and “B. How important to you are your ideal body proportions?”. Discrepancy scores (Part A) were recoded from 0 to -1. Then, a mean of item-by-item cross-products (Part A by Part B) is calculated, with scores ranging from -3 to +9. Higher scores represent a higher discrepancy between the actual and ideal self, as well as a strong sense of importance placed on these physical ideals, while lower scores represent the contrary. The BIQ was used in addition to the MBSRQ-BASS as some relevant attributes, such as physical strength, are not assessed by the MBSRQ-BASS and the BIQ also includes the extent participants care about each attribute in calculating final scores. Adequate score reliability (internal consistency of .76) and validity (correlates with well-validated measures of body image, such as the Appearance Schemas Inventory-Revised, .58; Cash, 2000) are reported. A Cronbach’s alpha coefficient of .80 was obtained in the current study.

Rosenberg Self-Esteem Scale (RSES). The RSES is a 10-item self-report measure that assesses trait self-esteem (Rosenberg, 1965). Items are scored on a 4-point Likert-format scale ranging from ‘*strongly agree*’ to ‘*strongly disagree*’, with reverse-coding where appropriate. A sample item is: “On the whole, I am satisfied with myself”. The sum of all 10 items are calculated. Scores may range from 10-40, with scores between 0-15, 15-25, and above 25 indicating low, normal, and high self-esteem. Among adults in Western cultures, RSES scores demonstrate reliability (internal consistency scores ranging from .77 to .88 and test-retest reliability ranging from .82 to .85) and validity (criterion validity = .55 and construct validity correlated with anxiety [$r = -.64$], depression [$r = .54$], and anomie [$r = -.43$]; Rosenberg, 1965). The internal consistency of the RSES scores for the current study was .89.

Eating Attitudes Test (EAT-26). The EAT-26 is a standardized self-report measure that examines concern characteristics and symptoms of abnormal, disturbed, or exaggerated eating behaviours (Garner, Olmsted, Bohr, & Garfinkel, 1982). Items are scored on a 6-point rating scale ranging from 0 (*never, rarely, sometimes*) to 3 (*always*), with item 26 being reverse-coded. A sample item is: “Eat diet foods”. All 26 items are added together to obtain a possible score out of 78, with higher scores indicating higher levels of concern about body weight, dieting, and/or problematic eating behaviours. Scores on the EAT-26 are highly correlated with the EAT-40 (i.e., the original, longer form of the questionnaire), which showed high concurrent score validity ($r = .87$) in young adult women (Garner et al., 1982) and has been utilized by other researchers with middle-aged women. A Cronbach’s alpha value of .83 was obtained for the current study.

Qualitative Measures

In addition to the aforementioned components of the survey, participants were asked to answer the following two open-ended questions: “What are your motivations for participating in CrossFit?” and “How is the atmosphere of your CrossFit affiliate different than other environments you have/do exercise in (e.g., a typical fitness centre, yoga studio, bootcamp, etc.)? Please explain.”

Data Analysis

Quantitative analysis. Data analysis was completed using SPSS version 25 for MAC (IBM Corp, 2017). Prior to analysis, data were checked for entry accuracy as well as internal consistency (see above Cronbach’s alpha values), where applicable. Correlation analyses were conducted (Table 1). Additionally, a correlation analysis was conducted to determine if age, an independent demographic variable, was associated with any of the dependent variables in each respective multiple linear regression. Age showed no significant correlation with any dependent variables and was not included in further analyses.

Table 1. *Participant Demographics (N = 149), Scores for Psychosocial Variables, and Correlations for Study Variables*

	Minimum	Maximum	Mean (SD)	1	2	3	4	5	6	7
1. CrossFit Skill Level (score, 1 to 5)	1	4	2.62 (0.84)	-						
2. CrossFit Length (months)	1	104	31.33 (23.34)	.531	-					
3. CrossFit Frequency (days/week)	1	7	4.23 (1.28)	.431	.206	-				
4. MBSRQ-BASS ¹ (score, 1 to 5)*	2	5	3.53 (.59)	.373	.232	.096	-			
5. BIQ ² (score, -3 to 9)**	-2.18	5.27	1.46 (1.43)	.376	.286	.207	.625	-		
6. RSES ³ (score, 10 to 40)*	18	40	31.62 (5.16)	.153	.213	.109	.587	.553	-	
7. EAT-26 ⁴ (score, 0 to 78)**	0	42	9.93 (8.41)	.141	.253	.001	.333	.413	.400	-

Note. *higher scores indicate better outcomes, **lower scores indicate better outcomes

¹Multidimensional Body-Self Relations Questionnaire: Body Areas Satisfaction Scale

²Body Image Ideals Questionnaire

³Rosenberg Self-Esteem Scale

⁴Eating Attitudes Test

Four separate multiple linear regressions were performed. Each dependent variable (MBSRQ-BASS, BIQ, RSES, and EAT-26) was regressed against all independent variables (CrossFit length, frequency, and skill level). To correct for multiple comparisons, an alpha level of .0125 per test (.05/4) was established (Bonferoni, 1935). G*Power was used to conduct a statistical power analysis. With an α of .05, a β of .2, and anticipating a medium effect size ($f^2 = .15$), the projected sample size needed was approximately $N = 77$. Descriptive analyses were performed on all variables. All assumptions, including multicollinearity, were verified. Residual normality was present for all dependent variables, excluding the EAT-26, which was positively skewed. No transformations were made as a positive skew was expected because the prevalence of eating disorders in Canada is only approximately 2-3% (National Initiative for Eating Disorders, 2017).

Qualitative analysis. Open-ended questions (i.e., motivation and the environment) were coded using Braun and Clarke’s (2006) thematic analysis. Coders were trained using Maguire and Delhunt’s (2017) step-by-step training guide for conducting Braun and Clarke’s (2006) thematic analysis. Codes were then grouped and sorted to identify patterns and themes. The frequency of each theme was identified based on the number of times codes pertaining to each theme were present in different participants answers (Köteles et al., 2016).

Trustworthiness. Half of the open-ended survey answers coded by the primary researcher were coded by a second researcher and the presence of and frequency of themes were compared, exceeding Barbour’s (2001) suggested minimum of 20% to ensure adequate response variations. A percentage agreement of 90% was obtained between both researchers, above the percent agreement of 85% suggested by MacQueen, McLellan-Lemal, Bartholow, and Milstein (2008).

Results

Quantitative

Descriptive statistics for CrossFit-related and psychosocial variables are available in Table 1. A multiple linear regression analysis was conducted to evaluate if CrossFit-related independent variables were predictors of body satisfaction (MBSRQ-BASS). A significant regression equation was reported, $F(3, 145) = 8.269, p < .001$. Based on the model, predictor variables accounted for 13% (adjusted $R^2 = .128$). A breakdown of each predictor’s contribution to the model is provided in Table 2. Results suggest that only CrossFit skill ($t = 3.901, p < .001$) contributed significantly and positively to the model. A second multiple linear regression analysis was conducted to evaluate if any CrossFit-related independent variables predicted participants body image ideals (BIQ). A significant regression equation was reported, $F(3, 145) = 8.487, p < .001$. Based on the model, predictor variables accounted for 13% (adjusted $R^2 = .132$). A breakdown of each predictor’s contribution to the model is provided in Table 2. Results suggest that only CrossFit skill ($t = -2.765, p = .006$) contributed significantly to the model.

Table 2. Multiple Linear Regression Analyses

	Unstandardized Coefficients		Standardized Coefficients B	t	p value	B - 95% CI	
	B	SE B				Lower	Upper
MBSRQ-BASS¹							
CrossFit Skill Level	0.269	0.069	0.383	3.901	<0.001*	0.133	0.405
CrossFit Length	0.001	0.002	0.045	0.498	0.619	-0.003	0.006
CrossFit Frequency	-0.036	0.039	-0.078	-0.918	0.360	-0.113	0.041
BIQ²							
CrossFit Skill Level	-0.458	0.166	-0.271	-2.765	0.006*	-0.786	-0.131
CrossFit Length	-0.008	0.006	-0.129	-1.422	0.157	-0.019	0.003
CrossFit Frequency	-0.071	0.094	-0.064	-0.752	0.453	-0.257	0.115
RSES³							
CrossFit Skill Level	0.182	0.634	0.03	0.287	0.775	-1.072	1.436
CrossFit Length	0.041	0.021	0.185	1.941	0.054	-0.001	0.083
CrossFit Frequency	0.233	0.361	0.058	0.645	0.520	-0.48	0.945
EAT-26⁴							
CrossFit Skill Level	-0.402	1.024	-0.04	-0.393	0.695	-2.425	1.621
CrossFit Length	-0.089	0.034	-0.246	-2.6	0.010*	-0.156	-0.021
CrossFit Frequency	0.451	0.582	0.069	0.775	0.440	-0.699	1.601

Note. *Indicates significant at .0125.

¹Multidimensional Body-Self Relations Questionnaire: Body Areas Satisfaction Scale

²Body Image Ideals Questionnaire

³Rosenberg Self-Esteem Scale

⁴Eating Attitudes Test

A multiple linear regression analysis was conducted to evaluate if the CrossFit-related independent variables were predictors self-esteem (RSES). No significant regression equation was reported, $F(3, 145) = 2.562, p < .057$.

Lastly, a multiple linear regression analysis was conducted to evaluate if the CrossFit-related independent variables were predictors of disordered eating behaviours (EAT-26). A significant regression equation was found, $F(3, 145) = 3.530, p = .017$. Based on the model, predictor variables accounted for 7% (adjusted $R^2 = .068$). A breakdown of each predictor's contribution to the model is reported in Table 2. Results suggest that only CrossFit length ($t = -2.600, p = .010$) contributed significantly to the model.

Qualitative

All major themes derived from both open-ended questions are presented below. Similar to Koteles et al. (2016), frequency counts (Freq) and percentages (%) are provided in parentheses to identify the number of participants whose answers referred to each theme. If a participant's motives encompassed multiple themes, frequency counts were attributed to all themes present.

Motivation themes.

Physical abilities (Freq = 121, 81.21%). The most commonly mentioned motivation for engaging in CrossFit was physical health and/or abilities, with more than three-quarters of participants mentioning reasons such as getting stronger, building muscle, becoming more fit, and/or improving their overall physical health/abilities. For example, one woman (Affiliate 2, age 28, frequency = 5 days/week, length = 7 months, skill = advanced) was motivated "To get stronger. I really enjoy lifting heavy weight and having fun and CrossFit really fulfills what I look for in a workout/fitness."

Challenging (Freq = 52, 34.90%). Another theme discovered was that participants were motivated by the challenge of learning new skills/movements and challenging the limits of their bodies. Examples include "challenging myself mentally and physically" (Affiliate 5, age 25, frequency = 5 days/week, length = 48 months, skill = competitive), "push a little harder and move a little faster" (Affiliate 2, age 33, frequency = 4 days/week, length = 60 months, skill = advanced), and "challenge of learning new skills and progressions" (Affiliate 3, age 39, frequency = 4 days/week, length = 60 months, skill = advanced).

Community (Freq = 45, 30.20%). Thirdly, participants mentioned the community created within CrossFit affiliates as a motivator for their continued participation. Many women specifically highlighted that working out in a CrossFit affiliate provided them with opportunities to socialize, meet new people, build friendships, and be part of a supportive and positive community. For example, one woman (Affiliate 5, age 21, frequency = 4 days/week, length = 13 months, skill = advanced) said she was motivated by the "the community and the fitness it encourages (pushes me every day)."

Mental health (Freq = 29, 19.46%). A number of participants referenced benefits to their mental health. Many women reported participating in CrossFit made them feel good/great, provided stress-relief, and had a positive effect on their mood. In addition, a few participants also mentioned specific improvements in body image and self-esteem. For example, one woman (Affiliate 3, age 28, frequency = 3 days/week, length = 3 months, skill = advanced) listed "health, community, body image, stress relief, mental health" as her motivations for attending CrossFit.

Aesthetics and weight management (Freq = 22, 14.77%). Several participants stated aesthetics- and weight-related motivations for participating in CrossFit. Examples of aesthetic-related motivations range from general desires to "look good" (Affiliate 1, age 43, frequency = 5 days/week, length = 18 months, skill = intermediate), to specific goals of "want[ing] a 6 pack" (Affiliate 2, age 32, frequency = 6 days/week, length = 18 months, skill = advanced). In addition, examples of weight-related motivations included: "to lose weight" (Affiliate 1, age 61, frequency = 5 days/week, length = 4 months, skill = intermediate) and "to get skinny" (Affiliate 1, age 31, frequency = 4 days/week, length = 64 months, skill = advanced).

Programming (Freq = 15, 10.07%). Some participants were motivated by the presence of structured programming delivered by a trained coach. For example, one woman enjoyed having a coach present "to ensure [she's] doing things correctly" (Affiliate 1, age 37, frequency = 3 days/week, length = 60 months, skill = advanced), whereas another emphasized that "workouts are prescribed, laid out, I just show up" (Affiliate 2, age 42, frequency = 1 day/week, length = 14 months, skill = advanced).

Role model for family (Freq = 8, 5.37%). The last motivation-related theme discovered was the desire to be a role model for family. Although not mentioned as frequently as other themes, a few women were inclined to engage in CrossFit "to lead by example by having a healthy life" (Affiliate 2, age 34, frequency = 5 days/week, length = 54 months, skill = advanced), or "get in shape for my kids" (Affiliate 5, age 34, frequency = 5 days/week, length = 4 months, skill = beginner).

CrossFit environment themes.

Community (Freq = 117, 78.52%). The most frequently referenced difference was the sense of community believed to exist within CrossFit affiliates compared to the perceived lack thereof in other exercise environments. For example, one woman stated that she felt the biggest difference was "[...] the community atmosphere. Everyone is encouraging everyone else to be their best. Everyone is at different points in their fitness journey and we encourage everyone to be better" (Affiliate 3, age 34, frequency = 5 days/week, length = 54 months, skill = advanced). However, one woman (Affiliate 2, age 24, frequency = 3 days/week, length = 2

months, skill = beginner) did mention that she sometimes feels nervous or even uncomfortable in the group atmosphere when others are encouraging her or cheering her on.

Inclusion (Freq = 47, 31.54%). Another distinction identified was the difference in inclusion at CrossFit affiliates compared to other exercise environments. Many women stated that they felt less judgement from other members or coaches, and were not as concerned about their appearance, weight, or abilities. Many women described their CrossFit affiliate as more “welcoming,” “accepting,” and “comfortable” compared to traditional gyms, and Pilates studios, among others. Yet, one woman did highlight that small cliques within this community still existed.

Programmed (Freq = 38, 25.50%). Several women also identified that CrossFit is unique in its combined use of group-based classes led by knowledgeable coaches and constantly varied, structured programming. For example, one woman said she preferred CrossFit because “a coach is present to lead you through each activity, monitor your progress, and help fix anything you might be doing wrong” (Affiliate 1, age 35, frequency = 5 days/week, length = 27 months, skill = advanced), whereas another said she “enjoys the structured programming” (Affiliate 4, age 46, frequency = 4 days/week, length = 2 months, skill = intermediate).

Challenging (Freq = 30, 20.13%). The last theme differentiating CrossFit from other exercise environments was related to pushing limits and challenging physical and mental abilities. Many women expressed that they felt CrossFit was more challenging and encouraged them to “push each other, and suffer through workouts together [...]” (Affiliate 4, age 27, frequency = 3 days/week, length = 60 months, skill = competitive).

Discussion

The aim of this study was to contribute to the limited existing literature surrounding CrossFit participation variables (i.e., CrossFit skill, length, and frequency) and women’s body image, self-esteem, and eating behaviours. Secondly, this study also sought to uncover women’s motivations for participating in CrossFit and identifying differences CrossFit and other exercise environments.

Multiple linear regressions results revealed that CrossFit skill positively predicted women’s body image using both the MBSRQ-BASS and the BIQ. Specifically, higher CrossFit skill was associated with higher levels of satisfaction for most areas of the body, as well as greater self-ideal congruence with strongly held physical ideals. The current results are consistent with a previous meta-analysis (Campbell & Hausenblas, 2009) that reported positive associations between physical activity and body image, as well as a quantitative-based CrossFit specific study by Baştuğ et al. (2016) that reported a similar trend. Results of the current study also provide further evidence that self-perceived physical skill and/or fitness is positively associated with body image (Zamani Sani et al., 2016). This study’s findings are congruent with those of Zamani Sani et al. (2016) who posited that, consistent with the theory of self-concept, not only does the act of participating in physical activity itself contribute to increases in body image, but that the increases may also partially be attributed to the opportunity exercise provides to increase one’s physical fitness and skills. Moreover, CrossFit’s use of strength training may be particularly effective in increasing body image, as Martin Ginis, Strong, Arent, Bray, and Bassett-Gunter (2014) suggested that strength training and improvements in strength-related fitness and skill have a greater effect than aerobic-based exercise.

The current study’s thematic analysis of open-ended questions also supports the quantitative results regarding body image. The fourth most common thematic motivation discovered in the current study was mental health. Although many women did not clarify their motivations beyond stating “mental health,” others referenced, more specifically, improvements in body image. Moreover, although almost 15% of women referenced appearance or weight, the most frequently mentioned motivation for participating in CrossFit was physical health and abilities. Examples of such abilities included endurance, flexibility, strength, and more specific examples such as pull-ups and *double unders* (i.e., an advanced form of skipping). Thus, improvements in physical skills were a much stronger motivator for women than actual physical appearance and provides further evidence that improvements in perceived physical fitness and skills contributes to positive increases in body image satisfaction. Yet, this is not to say that women participating in CrossFit are not concerned about their appearance, or that CrossFit does not exacerbate such concerns for some women (Washington & Economides, 2015). For example, CrossFit promotional materials been reported to both challenge hegemonic femininity (a positive), while simultaneously at times, also emphasizing attractiveness rather than performance (Washington & Economides, 2015). However, contrary to what is displayed in CrossFit promotional materials, results of the current study suggest that women attending CrossFit affiliates typically perceived the environment to be inclusive (theme) and to provide a non-judgmental, community-based atmosphere (theme) where women are encouraged to value improvements in skill and abilities over aesthetics. Thus, such an environment may positively impact body image, as women may be less critical of their appearance. In addition, many women perceived that, unlike many exercise environments, the lack of mirrors in CrossFit affiliates allowed them to focus on what their body was doing, and not its appearance. One woman further explained that “it takes the vanity out of the typical fitness routine,” which supports previous research that the presence of mirrors created a heightened awareness and concern for appearance among women (Prichard & Tiggemann, 2008). Conversely, as reported by Podmore and Ogle (2018), it should be noted that not all women attending CrossFit affiliates

associate their participation with positive influences on psychosocial health, with a small number of women suggesting that their participation in CrossFit negatively influenced their body image and that some experienced feelings of oppression and or agency. Thus, for the current study, it may have been the choice of and phrasing of open-ended questions that resulted in mostly positive expressions, as both questions were asked in a way that would highlight the benefits, rather than the potential negatives, associated with attending a CrossFit affiliate. However, one woman did express that it made her nervous and uncomfortable, both physically and mentally, when she was one of the last ones finishing the workout and others were watching and cheering her one.

The current study's findings are similar to those of previous qualitative studies that reported that the CrossFit environment generally deemphasizes appearance and celebrates performance (Podmore & Ogle, 2018; Knapp, 2015; Edmonds, 2019). Similar to Partridge et al. (2014), many women discussed the "challenge of learning new skills" and the concept of pushing the body "out of [its] comfort zone" as aspects unique to the CrossFit environment. Many women also expressed feeling a sense of accomplishment after mastering a new skill or finishing a hard workout. As such, the challenge and desire to learn and master new skills may indirectly or directly contribute to the quantitative associations between CrossFit skill and body image. Yet, as was also reported by Köteles et al. (2016), the length or frequency of CrossFit attendance was not a predictor of body image. The current findings may suggest that simply attending CrossFit classes is not enough, but that women participating in CrossFit must show improvements in skill in order to reap body image-related benefits.

The second psychosocial variable examined in the current study was self-esteem. Although much scientific literature provides evidence of a positive association between exercise and self-esteem (Lox, et al., 2010), the current study's quantitative findings are similar to previous CrossFit specific studies, which suggested no link between CrossFit participation and self-esteem (Eather et al., 2016; Köteles et al., 2016). Yet, when Eather et al. (2016) examined only those individuals 'at risk' for psychological problems, a significant positive association between CrossFit participation and self-esteem was reported. As such, perhaps CrossFit participation only has a statistically significantly beneficial influence on self-esteem if the individual's self-esteem was low before beginning CrossFit. In addition, the current study only utilized a measure of trait self-esteem. As such, perhaps significant associations between CrossFit participation and state self-esteem do exist, but do not translate into trait self-esteem. Conversely, due to the relatively high cost of CrossFit, women attending CrossFit affiliates may be of higher socioeconomic status than the average individuals. Moreover, von Soest, Wagner, Hansen and Gerstorff (2018) reported positive associations between socioeconomic status and self-esteem. Thus, perhaps no significant changes in self-esteem were observed in the current studies as these women were likely of high socioeconomic status, and potentially contributing to their already high baseline self-esteem.

Furthermore, the results of the current study's open-ended questions somewhat contradict the quantitative findings, as mental health was a common motivational theme. Women provided a variety of general (e.g., "mental health) and specific (e.g., "CrossFit makes me feel great about myself, I feel happier and healthier") examples of ways CrossFit benefitted their mental health. In addition, the lack of a statistically significant association between CrossFit participation and self-esteem was incongruent with qualitative analysis as the majority of women felt CrossFit created an inclusive community that deemphasized appearance, characteristics which are associated with fostering positive self-esteem (Williams & Galliher, 2006), as well as continued exercise participation. One potential explanation for the nonexistent quantitative association between CrossFit and self-esteem may be due to the specific self-esteem assessment tool used. In a quantitative review, Spence, McGannon, and Poon (2005) reported that although exercise may have a positive effect on self-esteem, this association may be small at the global level. Thus, the lack of a significant association in the current study may be due to the multidimensional nature of self-esteem (Sonstroem & Morgan, 1989). Specifically, although exercise participation may have an influence on specific domains of self-esteem, such as physical competence and/or physical appearance self-esteem, it may not have a considerable influence on other domains of self-esteem (Donnellan, Trzesniewski, Conger, & Conger, 2007; Sonstroem & Morgan, 1989). As such, the impact of exercise participation on global self-esteem, as measured in the current study, may be minimal (Donnellan et al., 2007).

The last outcome examined in relation to CrossFit participation was eating behaviours. To the authors' knowledge, this study is the first of its kind to quantitatively examine the eating behaviours of women participating in CrossFit. Specifically, this study sought to investigate whether or not women's CrossFit participation could predict disordered eating behaviours. The multiple linear regression revealed that length of time since beginning CrossFit was a small, but significant predictor of women's eating behaviours, with longer attendance (i.e., CrossFit length) predicting lower disordered eating scores. Although a lack of quantitative research exists, a few studies have qualitatively examined the eating patterns of individuals participating in CrossFit (Edmonds, 2019; Podmore & Ogle, 2018; Simpson et al., 2017). Podmore and Ogle (2018) reported differing experiences among women who participate in CrossFit, with some women feeling as though they were pressured to adhere to a specific diet (often Paleo or 'clean' eating), and others suggesting they felt they had adopted a more relaxed approach to eating. However, in contrast to the current study's quantitative results, the majority of participants in Podmore and Ogle (2018) reported that the CrossFit environment (coaches and other members) promoted restrictive eating in order to see "results." Conversely, interviews by Simpson et al. (2017) revealed that many participants self-reported eating healthier since joining CrossFit. Yet Simpson et al. (2017)

also noted that some still followed a specific diet, which could be interpreted as a form of restriction/dieting, a component of disordered eating. Thus, similar to the current study, perceptions of what constitutes healthy and/or disordered eating are relative. Although some individuals may feel they have adopted healthier eating habits, not all of these changes (e.g., counting calories or restricting specific types of food) are necessarily healthy habits according to published guidelines (Health Canada, 2019; LaCaille, 2013). Thus, future research could benefit from investigating if members of CrossFit affiliates perceive nutrition-related recommendations offered by CrossFit to be healthy (e.g., for performance enhancement) or whether they identify them as encouraging disordered eating (e.g., restriction or dieting).

Regarding responses to the open-ended questions, only two participants mentioned eating behaviours in response to the motivation-based question, and no participants discussed eating behaviours in response to the CrossFit environment-based question. This was not entirely unexpected as neither question specifically addressed eating behaviours. Of the two participants that mentioned eating behaviours, both suggested that their CrossFit participation motivated them to adopt a healthier diet and better eating habits, lending limited support to quantitative results. However, as previously discussed, perceptions surrounding both healthy and disordered eating habits are subjective. Thus, without further probing, the authors were not able to determine if the eating habits adopted by these individuals were in fact healthy, based on objective criteria (Health Canada, 2019; LaCaille, 2013).

Yet, some of the discovered themes may provide initial insight into the statistical findings. For example, more women were motivated to improve their physical health and abilities through CrossFit, than to improve their aesthetics or manage their weight. This deemphasis on appearance, reinforced by the inclusive community, may potentially be allowing women to feel less restrictive in their eating behaviours as they are not as concerned with achieving the 'ideal' body. In addition, many women expressed changes in their motivation with continued participation, which may help further decipher the quantitative results. Some participants expressed that they originally participated in CrossFit as a means to manage their weight or get skinny, but that they have since changed their focus to getting stronger or accomplishing a new skill, again potentially leading to less disordered eating behaviours.

Lastly, as evidenced throughout both the results and discussion sections, there is an influential relationship that exists between humans and their environment that contributes to shaping their development, including their psychosocial health (Bronfenbrenner, 1974). Specifically, this study highlighted how an individual's relationships with others [i.e., the interpersonal level of the socio-ecological model (e.g., relationship with other members at their CrossFit affiliate)], as well as their interactions with their exercise environment [i.e., organizational level (e.g., attending a CrossFit affiliate and the environment created within it)] influenced, to varying degrees (i.e., either qualitatively or quantitatively), their body image, self-esteem, and/or eating behaviours.

Limitations and Future Research

Despite this study's novel use of multiple methods to investigate associations between CrossFit and psychosocial health, it is not without its limitations. First, only five CrossFit affiliates were included in this study. As such, the results of this study may not be generalizable to the entire CrossFit population. Additionally, although it would have been preferred to have CrossFit variables (e.g., CrossFit skill and length) objectively measured, for reasons of feasibility, these CrossFit variables were self-reported. This study is also limited as demographic variables, such as race or ethnicity, were not taken into consideration, despite being potentially influential. In addition, surveys were not completed in a randomized order, preventing the researchers from eliminating order bias and potentially relevant demographic covariates (e.g., ethnicity) were not included in the analysis. Also, due to feasibility reasons, open-ended survey questions were used to obtain qualitative data. Although an acceptable practice (Topp et al., 2015), the use of semi-structured interviews would have provided richer data. In addition, the study was limited by its use of a global self-esteem. Future studies may benefit from using a more domain-specific measure of self-esteem. Although this study was the first to quantify an association between women's CrossFit length and their eating behaviours, only limited qualitative research was provided. As such, future research should continue to quantitatively investigate this potential link, while also providing more qualitative support.

Conclusions

This study's quantitative analysis builds upon the limited current research (mostly qualitative) regarding the potential impact of CrossFit participation on women's body image, self-esteem, and eating behaviours, increasing result generalizability. Findings revealed that CrossFit participation may statistically and positively influence women's body image and eating behaviours, but not global self-esteem. Responses to open-ended questions regarding motivations for participating in CrossFit and the identified differences between CrossFit and other exercise environments may provide support and possible insight into these quantitative findings, as well as providing current CrossFit affiliate owners insight into the motivational and environmental preferences of their women members. In summary, this study provides both quantitative and qualitative evidence that CrossFit may be a viable exercise modality for women looking to improve their psychosocial health.

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