

RESEARCH ARTICLE

Body-related Sport and Exercise Motives and Disturbed Eating Attitudes and Behaviours in Adolescents

Christophe Maïano^{1,2,*†}, Alexandre J. S. Morin^{2†}, Marie-Christine Lanfranchi^{3,4} & Pierre Therme³

¹Cyberpsychology Laboratory, Department of Psychoeducation and Psychology, Université du Québec en Outaouais, Canada

²Institute for Positive Psychology and Education, Australian Catholic University, Australia

³Aix Marseille Université, CNRS, ISM UMR 7287, Marseille, France

⁴Direction Régionale de la Jeunesse, des Sports et de la Cohésion Sociale – Provence-Alpes-Côte-d'Azur, Marseille, France

Abstract

Motives underlying sport and exercise involvement have recently been hypothesized as potential factors influencing the positive association between sports/exercises involvement and disturbed eating attitudes and behaviours (DEAB) among adolescents. Nevertheless, very few studies have examined this hypothesis or the moderating role of gender, context of practice, performance levels and sport type on these relationships. In this study, these questions were addressed among 168 male and 167 female French adolescents involved in various types, contexts and performance levels of sport and exercise. Participants were asked to indicate their main motives for involvement in sport practice and to self-report DEAB (generic DEAB, vomiting–purging behaviours, and eating-related control) on a French adaptation of the Eating Attitudes Test-26. The results shared positive associations between body-related sport and exercise motives and most of the DEAB subscales. Furthermore, they show that the relationship between body-related sport and exercise motives and Vomiting–Purging Behaviours differs according to involvement in individual and competitive sports and exercises. Copyright © 2015 John Wiley & Sons, Ltd and Eating Disorders Association.

Keywords

disturbed eating attitudes and behaviours; body-related motives; gender; sport type; context of sport and exercise; performance level; moderation

*Correspondence

Christophe Maïano, Université du Québec en Outaouais, Campus de Saint-Jérôme, Département de Psychoéducation et de Psychologie, 5 rue St-Joseph, Saint-Jérôme (Québec) J7Z 0B7, Canada.

Email: christophe.maiano@uqo.ca

[†]The first two authors (C. M. and A. J. S. M) contributed equally to this article and their order was determined at random; both should be considered first authors.

Published online 14 May 2015 in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/erv.2361

Empirical studies have reported the existence of a positive association between sport and exercise practice, [which refers to practicing organized (e.g. in a school sport association) or non-organized (free or informal) sports and fitness activities or exercises alone or in a team for recreational or competitive purposes] and the presence of disturbed eating attitudes and behaviours (DEAB) among adolescents (e.g. Baum, 2006; Byrne & McLean, 2001; Hausenblas & Carron, 1999; Smolak, Murnen, & Ruble, 2000). Among the various factors (for reviews, see Dosit, 2008; Petrie & Greenleaf, 2012; Thompson & Sherman, 2010) that might explain this relationship, the motives underlying involvement in sport and exercise have recently come under examination. Motives reflect the contents of individuals' goals for a particular behavioural domain (Ingledeu & Markland, 2008; Ingledeu, Markland, & Fergusson, 2009). 'They are what individuals aim to attain or avoid through participating in the behaviour' (Ingledeu et al., 2009, p. 337) and are intimately related to the individual's motivational orientation for various activities (Ingledeu & Markland, 2008; Markland & Ingledeu, 2007), which reflects '...the perceived locus of causality of the goal' (Ingledeu & Markland, 2008, p. 809). Within the framework of self-determination theory (SDT; Deci &

Ryan, 2000; Ryan & Deci, 2000), an individual's motivation is seen as located on a continuum ranging from purely extrinsic forms of motivation to purely be intrinsic forms of motivation (i.e. self-determined). Along this continuum, the less self-determined forms of motivation include purely external (the individual perceives or receives explicit or implicit external pressure to perform the activity) or introjected (the individual has internalized these initially external pressures to perform the activity) sources of regulation (Deci & Ryan, 2000; Ingledeu & Markland, 2008; Ryan & Deci, 2000; Verstuyf, Patrick, Vansteenkiste, & Teixeira, 2012). Conversely, the more self-determined forms of motivation are those with an identified (the individual consciously values the behaviour), integrated (the individual's needs and values are aligned with the behaviour) or intrinsic (the individual enjoys the activity) source of regulation (Deci & Ryan, 2000; Ingledeu & Markland, 2008; Ryan & Deci, 2000; Verstuyf et al., 2012).

In sport and exercise, motives are the reasons that individuals give for practicing, such as the goals to which they aspire in this context (Markland & Ingledeu, 2007). Several motives (up to 14; for a broader description, see Markland & Ingledeu, 1997; Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997) have been

identified as possibly related to sport and exercise involvement, and they can be grouped into four higher-order categories (Ingledeu & Markland, 2008): (i) body-related (weight and appearance management); (ii) health/fitness-related (health pressures, ill-health avoidance, strength, endurance, stress management, etc.); (iii) social-engagement-related (social recognition, affiliation, competition, challenge, performance, etc.); and (iv) enjoyment-related.

Markland and Ingledeu (2007) hypothesized that the various sport and exercise motives generally tend to reflect different positions on the self-determination continuum. More precisely, their results show that body-related motives tend to reflect a predominantly external form of motivation (external and introjected regulation), whereas health/fitness (identified regulation), social engagement (intrinsic regulation) and enjoyment (intrinsic motivation) tend to reflect more predominantly self-determined forms of motivation (e.g. Ingledeu & Markland, 2008; Ingledeu et al., 2009). This suggests that involvement in sport and exercise for health/fitness, social engagement or enjoyment motives tends to be more autonomously driven and to reflect personal choice and interest to a greater extent than involvement in sport and exercise for body-related motives, which tends rather to be externally driven. In fact, Western ideal physical standards emphasize leanness for girls (Garner, Garfinkel, Schwartz, & Thompson, 1980) and muscularity for boys (McCreary & Sasse, 2000) and can easily be accompanied by implicit or explicit sociocultural pressures to manage one's body weight, shape and appearance to meet these standards. Involvement in sport and exercise for body-related motives may thus be driven by a desire to be thinner or more muscular (Petrie & Greenleaf, 2012).

SDT thus provides a useful framework for investigating the relationships between the motives underlying involvement in sport and exercise and DEAB (Vinkers, Evers, Adriaanse, & de Ridder, 2012). Indeed, outside of the sport and exercise context, recent SDT studies showed that low levels of self-determination about eating regulation tend to be associated with higher levels of DEAB (e.g. Brannan & Petrie, 2011; Frederick & Grow, 1996; Leong, Madden, Gray, & Horwath, 2012; Pelletier & Dion, 2007; Pelletier, Dion, & Lévesque, 2004a; Pelletier, Dion, Slovinec-D'Angelo, & Reid, 2004b). These results suggest thus that DEAB may be a mean that individuals can use to deal with perceived external pressure to meet sociocultural physical standards. When transferred to the sport and exercise context, these results suggest that individuals who exercise or practise sports for body-related motives may tend to be more strongly influenced by perceived sociocultural pressures and thus also more likely to present higher levels of DEAB. Alternatively, individuals who exercise or practice sports in a more self-determined manner (i.e. not for body-related motives) will tend to be less sensitive to these sociocultural pressures and thus less likely to present high levels of DEAB.

In addition, at least for more externally motivated individuals who are highly sensitive to sociocultural pressures (e.g. Kopp & Zimmer-Gembeck, 2011; Pelletier & Dion, 2007; Pelletier et al., 2004b), it is possible that specific sport-related and exercise-related characteristics will further contribute to the increase in levels of perceived pressure to meet sociocultural body weight and shape standards. Indeed, in some sport and exercise contexts,

the body is highly scrutinized, and body weight and shape information is even used to evaluate athletic performance (Petrie & Greenleaf, 2012). Because of this increased level of scrutiny, individuals involved in these sport and exercise contexts may be implicitly or explicitly pressured to control their physique and may thus become motivated to adopt unhealthy eating attitudes and behaviours as an additional means of doing so (Petrie & Greenleaf, 2012; Thompson & Sherman, 2010). According to Petrie and Greenleaf's (2012) review, this pressure may originate from the sport and exercise context (e.g. type of uniforms, performance demands and rewards, motivational climate), the type of sport and exercise (e.g. aesthetic, based on weight categories, individual), the performance level (e.g. elite) and significant others' comments, expectations, attitudes and behaviours (e.g. coach, instructors, parents, teammates, peers). It is thus hypothesized that specific sport-related and exercise-related characteristics may exacerbate the direction (positive or negative) and/or the strength of the relationships between body-related motives and DEAB.

So far, studies examining the relationship between body-related motives and DEAB have been essentially conducted with samples of adults and undergraduate students (e.g. Gonçalves & Gomes, 2012; McDonald & Thompson, 1992; Mond, Hay, Rodgers, & Owen, 2006; Mond, Hay, Rodgers, Owen, & Beaumont, 2004; Mond, Myers, Crosby, Hay, & Mitchell, 2008; Prichard & Tiggemann, 2008; Silberstein et al., 1988; Vartanian et al., 2012; Vinkers et al., 2012). To date, only three studies have examined the relationship between body-related motives for sport and exercise and DEAB among adolescents (de Bruin, Woertman, Bakker, & Oudejans, 2009; Furnham, Badmin, & Sneade, 2002; Furnham & Calnan, 1998). This lack of research on adolescent samples is surprising. Indeed, it is well documented that adolescents tend to show increased levels of preoccupation or dissatisfaction with their body weight and shape as they undergo pubertal development (e.g. Ricciardelli & McCabe, 2001; Smolak, 2004)—especially girls. Thus, adolescents may be more tempted to be involved for body-related motives and use sport practice and/or DEAB as a compensatory behaviour to control their body weight and shape (e.g. Chamay-Weber, Narring, & Michaud, 2005; Stice, 2002).

Furnham and Calnan (1998) examined the relationship between body-related exercise motives (i.e. weight control, attractiveness, and body tone) and DEAB based on multiple criteria (i.e. drive for thinness, bulimia, and body dissatisfaction) among 143 English adolescent boys aged between 16 and 18 years. Their results showed a significant and positive relationship between body-related sport practice motives, drive for thinness and body dissatisfaction. However, no relationship was found between body-related exercise motives and bulimia. In a further study, Furnham et al. (2002) re-examined these relationships among 235 English adolescent boys and girls aged between 16 and 18 years. Their results again revealed a significant and positive association between body-related exercise motives and DEAB in the overall sample. In both of these studies, significant and positive relationships were found between fitness and health motives and drive for thinness, but they were lower in magnitude than those with body-related motives. Finally, de Bruin et al. (2009) examined the relationship between weight-related sport and

exercise motives (i.e. burning extra calories or controlling weight) and weight-control behaviours based on multiple criteria (i.e. dieting frequency, weight-control behaviours, and purge behaviours) among 140 Dutch adolescent girls aged between 13 and 18 years. Their results revealed that while controlling for age and body mass index (BMI), youth with weight-related motives presented significantly higher levels of dieting frequency, weight control behaviours, and purge behaviours compared with youth with other sport and exercise motives. Additional results also show a lack of significant association between weight-related motives and sport and exercise types (i.e. aesthetic, endurance, weight class, and ball game), performance level (i.e. recreational, non-elite, and elite) and weekly sport practice time.

However, because these studies present limitations, their findings must be interpreted with caution. First, apart from de Bruin et al. (2009), information about the weekly time and frequency of sport and exercise among the participants was lacking and thus not controlled for in the two remaining studies (Furnham & Calnan, 1998; Furnham et al., 2002). Therefore, it is unknown whether previous results were influenced by the participants' weekly time and frequency of involvement in sport and exercise.

Second, neither the effects of involvement in leanness¹ and individual sports and exercises nor those of the sport/exercise context (i.e. in a school sport association or a club vs free) were examined in these studies. Given that these characteristics were previously found to be related to higher levels of DEAB (e.g. Bratland-Sanda & Sundgot-Borgen, 2013; Dosit, 2008; Haase, 2009; Martinsen, Bratland-Sanda, Eriksson, & Sundgot-Borgen, 2010; Martinsen & Sundgot-Borgen, 2013; Petrie & Greenleaf, 2012; Sundgot-Borgen et al., 2013; Thompson & Sherman, 2010), these might be important factors to consider. Indeed, it remains possible that these types and contexts of sport and exercise may change the direction and/or the strength of the relationship between body-related motives and DEAB.

Third, with the exception of de Bruin et al. (2009), none of the remaining studies (Furnham & Calnan, 1998; Furnham et al., 2002) controlled for the potentially confounding effect of BMI and age. This is surprising, because research shows that BMI and age are significantly related to DEAB during adolescence (e.g. Snoek, van Strien, Janssens, & Engels, 2008; Stice, 2002). Therefore, the results observed in the previous studies may have been influenced by the adolescents' BMI and age, so that the relationship between body-related motives and DEAB might be due entirely to these two variables, or at least substantially reduced when they are properly controlled for.

Finally, these studies focused almost exclusively on the relationship between body-related motives and DEAB in single-gender samples (female: de Bruin et al., 2009; male: Furnham & Calnan, 1998). The only study that examined gender-based differences (Furnham et al., 2002) showed that the positive relationship between body-related motives and DEAB generalized to boys and girls. Nevertheless, a major limitation of this study is that gender differences were examined through stratified analyses conducted

separately for each gender. This approach has several drawbacks and may lead to a number of statistical interpretation problems (Edwards & Lambert, 2007; Marsh, Hau, Wen, Nagengast, & Morin, 2012; Newsom, Prigerson, Schulz, & Reynolds, 2003; Stone-Romero & Anderson, 1994), including the need to rely on a suboptimal two-step strategy to test whether the relationships differ significantly from one another according to gender—which can be tested directly through interaction effects in the context of a generalized regression approach. Consequently, the issue of a potential moderating effect of gender on the relationship between body-related sport and exercise motives and DEAB is pending.

Based on the aforementioned earlier studies (de Bruin et al., 2009; Furnham & Calnan, 1998; Furnham et al., 2002) and their limitations, this study pursues two objectives. First, we seek to examine whether a significant relationship exists between body-related motives for sport and exercise and multiple DEAB criteria (generic DEAB, Vomiting–Purging Behaviours, and Eating-Related Control) in adolescents while controlling for the effects of age, BMI and degree of involvement (i.e. weekly time and frequency) in sport and exercise. Second, we examine whether the nature and/or the strength of the relationship between body-related motives for sport and exercise and DEAB differs according to gender and the types (leanness vs others; individual vs team), contexts (organized vs free) and performance level (competition vs non-competition) of sport and exercise.

Method

Participants and procedures

The descriptive statistics of the participants are reported in Table 1. The sample includes 335 adolescents aged between 11 and 18 years that were recruited from educational institutions

Table 1 Main characteristics of the participants

	M	SD	N (%)
Average age (in years)	14.50	2.07	
Average body mass index (in kg per m ²)	20.17	3.37	
Gender			
Boys			168 (50.1%)
Girls			167 (49.9%)
Ethnic background			
European			237 (70.7%)
African			78 (23.3%)
Others			20 (6%)
Average weekly time of SE (in hours per week)	3.33	1.94	
Average weekly frequency of SE (in times per week)	2.36	1.21	
Frequencies of adolescents involved in the following:			
Leanness SE			134 (40%)
Individual SE			203 (60.6%)
Organized SE			249 (74.3%)
Competitive SE			149 (44.5%)
Frequencies of body-related motive for SE			77 (23%)

Note: SE, sport and exercise.

¹According to Torstveit, Rosenvinge and Sundgot-Borden (2008), leanness sports can be defined 'as sports in which leanness and/or a specific body weight were considered important for performance (e.g. endurance, aesthetic, weight-class and anti-gravitation sports)' (p. 111).

located in Southern France. These adolescents are from a European, African or other ethnic background. They all attended regular physical education classes, while also exercising or practicing their main sport between one and eight times per week, for a weekly total of between 25 minutes and 12 hours.

These adolescents practiced a total of 46 different sports (e.g. badminton, basketball, boxing, gymnastics, judo, soccer) and exercises (e.g. fitness, jogging, weight training). Based on Sungot-Borden (1993) and Torstveit and Sungot-Borden's (2005), these sports and exercises were first categorized into leanness (coded 1; e.g. dancing, figure skating, gymnastics, boxing) or non-leanness (coded 0; e.g. archery, badminton, basketball, horse riding, sailing). Then, based on Haase's (2009) classification, they were categorized into individual (coded 1; e.g. horse riding, rock climbing) or team (coded 0; e.g. basketball, soccer) sports and exercises (see Table 1 for descriptive statistics). For a minority of sports (e.g. tennis, badminton, table tennis), no information was provided regarding involvement in single or double practice. Because these sports are most often practiced in single first (for this age group), they were categorized as individual sports.

This study was carried out following the recommendations of the research ethics committee of the University of Nice Sophia-Antipolis and was approved by the inspector of the Académie de Nice. The questionnaires were administered in class under standardized conditions and were completed only by adolescents who returned the consent forms signed by themselves and their parents.

Measures

Demographics and sport practice characteristics

The participants filled out a questionnaire in which they were asked to report their age, gender, height, weight and ethnic origin. From this information, their BMI was calculated as: BMI = weight/height². Participants were asked to report: (i)

whether they practiced a sport with the school sport association, outside the school in a club, outside the school by themselves or not; (ii) the sport that they practiced; (iii) the extent of their weekly involvement (in terms of duration and frequency) in their sport; and (iv) whether they competed or not in their sport, and, if so, the level of competition (e.g. leisure, local, regional or national). Based on these answers, the participants were classified according to whether they practiced their sport within: (i) an organized sport context (coded 1; i.e. a school sport association or a club) or not (coded 0; i.e. outside the school sport association or at a club); and (ii) a competitive sport context (coded 1) or not (coded 0). Descriptive statistics for all variables considered in this study, as well scale score reliabilities, are reported in Table 2.

Motives for involvement in sport and exercise

Participants were asked to select one to three motives for practicing their main sport and exercise among a list of 26 possibilities (e.g. 'to practice with friends', 'to lose weight', 'to reinforce the muscular tone', 'to have a nice body', 'to compete', 'to be more confident', 'to master a new ability'). Additionally, they were also allowed to tick the 'other' response and to indicate their own motives. These motives were then classified into four categories according to Markland and Ingledew (1997) and Ingledew and Markland's (2008) recommendations: (i) body-related (weight and appearance management); (ii) health/fitness-related (health pressures, ill-health avoidance, strength, endurance, stress management, etc.); (iii) social-engagement-related (social recognition, affiliation, competition, challenge, performance improvement, etc.); and (iv) enjoyment-related. For example, an adolescent who reported practicing sports to 'lose weight' was classified in the body-related sport motives category, whereas an adolescent reporting to do so to 'spend time with friends' was classified in social-engagement-related motives. For the analyses, all of the adolescents who reported exercising or practicing a sport for at least

Table 2 Means, standard deviations, correlations, and scale score reliabilities for the variables included in the present study

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age	—	-.06	.35***	.02	-.10	.02	-.12*	.09	.06	-.09	.03	-.14*	-.17**
2. Gender		—	-.03	.14**	.17**	-.21***	.03	-.26***	-.29***	.16**	-.41***	-.09	-.21***
3. Body mass index			—	-.003	.02	.20***	-.03	.03	-.04	-.05	.22***	-.02	.10
4. Weekly time of SE				—	.65***	.01	.27***	-.09	-.16**	.47***	-.04	.04	.02
5. Weekly frequency of SE					—	.03	.03	.01	-.13*	.23***	-.002	.09	.11*
6. Body-related motive						—	-.05	.12*	.05	-.03	.35***	.14**	.15**
7. Organized							—	-.09	-.03	.53***	.03	-.04	-.02
8. Leanness								—	.66***	-.27***	.12*	.02	.09
9. Individual									—	-.29***	.06	.01	.10
10. Competition										—	-.04	.01	-.10
11. Generic DEAB											—	.36***	.48***
12. VPB												—	.22***
13. ERC													—
M	14.50	.51	20.17	3.33	2.36	.23	.74	.40	.61	.44	18.55	2.57	11.53
SD	2.07	.50	3.37	1.94	1.21	.42	.44	.49	.49	.50	8.62	1.50	4.69
α		—	—	—	—	—	—	—	—	—	.85	.65	.69

Note: M, mean; SD, standard deviation; α, Cronbach's alpha; DEAB, disturbed eating attitudes and behaviours; ERC, Eating-related Control; SE, sport and exercise; VPB, Vomiting-Purging Behaviours.

*p < .05; **p < .01; ***p < .001.

one body-related motive (even they have chosen one or two other motives) were coded 1, while the others were coded 0.

Disturbed eating attitudes and behaviours

Disturbed eating attitudes and behaviours were assessed using the French adaptation (Maïano, Morin, Lanfranchi, & Therme, 2013) of the Eating Attitudes Test-26 (Garner, Olmstead, Bohr & Garfinkel, 1982), which includes 18 items (EAT-18) and assesses six dimensions: Fear of Getting Fat (four items; e.g. 'I am preoccupied with a desire to be thinner'), Social Pressure to Gain Weight (three items; e.g., 'I feel that others would prefer if I ate more'), Vomiting–Purging Behaviours (two items; e.g. 'I vomit after I have eaten'), Eating-related Control (five items; e.g. 'I am aware of the calorie content of the foods I eat'), Eating-related Guilt (two items; e.g. 'I feel extremely guilty after eating') and Food Preoccupation (two items; e.g. 'I feel that food controls my life'). Participants respond to the statements according to a six-level (6 = *always*, 1 = *never*) Likert-type scale. However, in order to keep the study as simple as possible while also maintaining an acceptable coverage of the range of DEAB, only three subscales were used in the present study. The first subscale entitled 'generic DEAB' measure the core symptoms of both anorexia nervosa and bulimia nervosa. As suggested by Maïano et al. (2013), this generic measure of DEAB was obtained by combining the Fear of Getting Fat, the Food Preoccupation and the Eating-related Guilt subscales. The second subscale entitled 'eating-related control' assesses characteristics more directly related to anorexia nervosa. The third subscale entitled 'Vomiting–Purging Behaviours' focuses on characteristics more closely associated with bulimia nervosa.

Data analyses

All of the analyses were performed using IBM SPSS 19.0 (Armonk, NY, USA). A small amount of data was missing at the item level for the EAT-18 (0.30% to 1.80%; $M_{\text{missing}} = 0.81\%$; $SD_{\text{missing}} = 0.59\%$). They were inputted using the expectation-maximization algorithm from IBM SPSS 19.0 'missing values' facility. Correlation analyses were conducted to examine the relationships between all variables considered in this study. The relationships between continuous variables (i.e. age, BMI, weekly time and frequency sport and exercise, and generic DEAB, Vomiting–Purging Behaviours and Eating-related Control) were examined using Pearson correlations. The relationships between continuous variables and dichotomous variables (i.e. gender; body-related motive; organized, leanness, competitive and individual sports and exercises) were examined using point-biserial correlations. Relationships between all dichotomous variables were examined using phi correlations.

Multiple regressions were conducted to study the relationships between scores on the DEAB subscales (i.e. generic DEAB, Vomiting–Purging Behaviours and Eating-related Control) and: (i) participants' age, BMI, involvement in sport and exercise (i.e. time or frequency²), gender (girls coded 0, boys

coded 1), body-related sport and exercise motives, and sport and exercise characteristics (organized, leanness, competitive and individual); and (ii) the interaction between body-related sport and exercise motives × gender, body-related sport and exercise motives × characteristics of sport and exercise (organized sports; leanness, competitive and individual sports and exercises), and gender × characteristics of sport and exercise. The analyses were conducted in three steps: (1) age, BMI and weekly time or frequency of sport and exercise; (2) participants' body-related motives, gender and characteristics of sport and exercise; and (3) the two-way interactions described previously. The two-way interactions were graphed using facilities developed by Dawson and Richer (2006); www.jeremydawson.com/slopes.htm.

Results

Correlations between variables

The results from the correlations are presented in Table 2. The key results first show that boys are significantly more involved in competitive sports and exercises [$\chi^2(1) = 8.52$, $p = .004$, $\phi = .16$] than girls. In addition, they also revealed that girls (coded 0), when compared with boys (coded 1): (i) present higher levels of generic DEAB ($\rho = -.41$, $p < .001$) and Eating-related Control ($\rho = -.21$, $p < .001$); (ii) more frequently practice leanness [$\chi^2(1) = 22.36$, $p < .001$, $\phi = -.26$] and individual [$\chi^2(1) = 28.33$, $p < .001$, $\phi = -.29$] sports or exercises; and (iii) more frequently exercise or practice a sport for body-related motives [$\chi^2(1) = 14.41$, $p < .001$, $\phi = -.21$] than boys. Second, adolescents involved in sport and exercises for body-related motives, when compared with those involved in sports and exercises for other motives: (i) exercise or practice leanness sports [$\chi^2(1) = 4.72$, $p = .03$, $\phi = .12$] more frequently; (ii) present higher levels of generic DEAB ($\rho = .35$, $p < .001$), Eating-related Control ($\rho = .14$, $p = .008$) and Vomiting–Purging Behaviours ($\rho = .15$, $p = .005$). Third, adolescents involved in leanness sports and exercises tend to exhibit higher levels of generic DEAB ($\rho = .12$, $p = .03$) than others. Finally, adolescents with high levels of generic DEAB tend to significantly report higher levels of Eating-related Control ($r = .36$, $p < .001$) and Vomiting–Purging Behaviours ($r = .48$, $p < .001$).

Association between predictors and DEAB

Age, body mass index, and weekly time and frequency of sport and exercise

The results from the multiple regression analyses are presented in Table 3. In the first step, the results reveal that younger adolescents were significantly more likely to report high levels of Vomiting–Purging Behaviours ($p = .02$) and Eating-related Control ($p < .001$). These results also show that adolescents with high levels of BMI were significantly more likely to present higher levels of generic DEAB ($p < .001$) and Eating-related Control ($p = .003$). However, neither weekly time nor weekly frequency of sport and exercise was significantly related to scores on any of the DEAB subscales.

²Weekly sport practice frequency (number of sessions) and time (number of hours) are highly correlated ($r = .65$, $p < .001$). Consequently, all of the regression models were tested first with only one of these two variables at a time and then together. Given that the results remained similar across these three models, it was decided that these two variables would be included in the full models.

Table 3 Hierarchical multivariate regression models predicting disturbed eating attitudes and behaviours scales

Steps	Variables	Generic DEAB			VPB			ERC						
		B (SE)	p	R ²	B (SE)	p	R ²	B (SE)	p	R ²				
1	Age	-.20(.24)	.42	.05	-.10(.04)	.02	.03	-.49(.13)	<.001	.07				
	BMI	.61(.15)	<.001		.01(.03)	.71		.24(.08)	.003					
	Weekly time of SE	-.21(.32)	.50		-.01(.06)	.86		-.12(.17)	.47					
	Weekly frequency of SE	.14(.51)	.79		.11(.09)	.23		.47(.27)	.09					
2	Age	-.21(.21)	.32	.29 [‡]	-.09(.043)	.03	.06	-.53(.13)	<.001	.13 [‡]				
	BMI	.49(.13)	<.001		.001(.03)	.97		.21(.08)	.007					
	Weekly time of SE	-.13(.31)	.68		-.03(.06)	.61		.06(.19)	.75					
	Weekly frequency of SE	.12(.46)	.80		.11(.09)	.22		.46(.28)	.10					
	Body-related motive	5.61(1.00)	<.001		.56(.20)	.005		1.11(.61)	.07					
	Gender	-6.15(.87)	<.001		-.01(.18)	.94		-1.57(.53)	.003					
	Organized	1.02(1.12)	.36		-.15(.22)	.50		.29(.67)	.67					
	Leanness	1.12(1.12)	.32		-.27(.23)	.23		-.35(.68)	.61					
	Individual	-1.45(1.14)	.21		.27(.23)	.23		.68(.69)	.33					
	Competition	.46(1.09)	.67		.28(.22)	.20		-1.07(.66)	.10					
	3	Age	-.19(.21)		.37	.35 [‡]		-.09(.04)	.03		.11	-.52(.13)	<.001	.15
		BMI	.50(.13)		<.001			-.001(.03)	.98			.21(.08)	.01	
Weekly time of SE		-.09(.30)	.76	-.03(.06)	.61		.07(.19)	.72						
Weekly frequency of SE		.10(.45)	.83	.11(.09)	.22		.49(.28)	.08						
Body-related motive		-2.44(2.62)	.35	.67(.53)	.21		1.46(1.63)	.37						
Gender		-9.08(2.20)	<.001	.24(.45)	.60		-3.01(1.37)	.03						
Organized		.79(1.67)	.64	.16(.34)	.65		.03(1.04)	.98						
Leanness		1.50(1.59)	.35	-.17(.32)	.60		-.71(.99)	.48						
Individual		-6.52(1.86)	.001	-.01(.38)	.98		.35(1.16)	.77						
Competition		-.49(1.63)	.76	.04(.33)	.92		-1.32(1.01)	.20						
Gender × Organized		-.35(2.25)	.88	-.12(.46)	.79		.95(1.40)	.50						
Gender × Leanness		-2.10(2.22)	.35	-.19(.45)	.68		-.13(1.38)	.93						
Gender × Competition		.32(2.04)	.88	-.05(.42)	.91		-.09(1.27)	.95						
Gender × Individual		6.21(2.32)	.008	.25(.47)	.59		1.17(1.44)	.42						
Body-related motives × Gender		-1.81(2.07)	.38	-1.12(.42)	.008		.62(1.29)	.63						
Body-related motives × Organized		2.26(2.65)	.39	-1.03(.54)	.06		-.36(1.65)	.83						
Body-related motives × Leanness		1.44(2.87)	.62	-.68(.59)	.24		2.32(1.79)	.20						
Body-related motives × Competition		2.61(2.47)	.29	1.31(.50)	.01		.22(1.54)	.89						
Body-related motives × Individual		7.85(3.06)	.01	1.28(.62)	.04		-2.50(1.91)	.19						

Note: BMI, body mass index; DEAB, disturbed eating attitudes and behaviours; ERC, Eating-related Control; SE, sport and exercise; VPB, Vomiting–Purging Behaviours. [‡]Delta R² is significant at *p* < .05.

Body-related motives, gender and characteristics of sport and exercise

The results from the second step show that adolescents involved in sport and exercise for body-related motives were significantly more likely to report high levels of generic DEAB (*p* < .001) and Vomiting–Purging Behaviours (*p* = .005). The results also show that boys significantly report lower levels of generic DEAB (*p* < .001) and Eating-related Control (*p* = .003). Finally, the results from the second step of the analyses revealed no significant association between characteristics of sport and exercise (organized, leanness, competitive, and individual) and DEAB scores.

Moderators of the association between body-related sport and exercise motives and DEAB

Gender as a moderator

The results from the third step reveal significant two-way interactions between gender and individual sports and exercises (*p* = .008) in the prediction of scores on the generic DEAB subscale

(Figure 1). Analysis by gender (the moderator) of the simple slopes of the predictor shows that girls involved in individual sports and exercises were significantly more likely to report low levels of

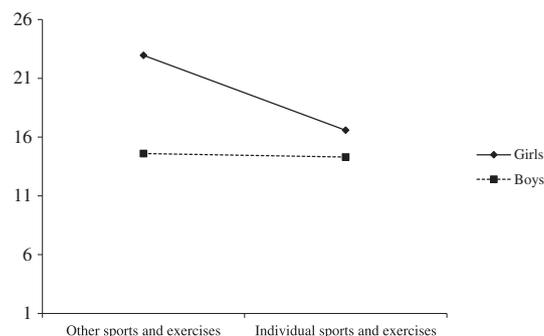


Figure 1 Generic disturbed eating attitudes and behaviours scores as a function of gender and individual sports and exercises

generic DEAB ($B = -6.52$, $SE = 1.86$, $p = .001$). However, this relationship was not significant for boys ($B = -.30$, $SE = 1.56$, $p = .85$).

The results also show significant two-way interactions between body-related sport and exercise motives and gender ($p = .008$) in the prediction of scores on the Vomiting–Purging Behaviours subscale. However, the simple slopes suggest that the association between the body-related sport and exercise motives and Vomiting–Purging Behaviours remains non-significant in boys and girls and that the significant interaction observed is actually an artefact of the inversion of the sign of the relationships across subgroups [girls ($B = .67$, $SE = .53$, $p = .21$); boys ($B = -.45$, $SE = .56$, $p = .42$)].

Characteristics of sport and exercise as a moderator

Looking at the characteristics of the sport and exercise context, we could see that some of them presented significant two-way interactions with body-related sport and exercise motives in the prediction of DEAB subscales. First, body-related sport and exercise motives interacted significantly with competitive sports and exercises ($p = .01$) in the prediction of scores on the Vomiting–Purging Behaviours subscale (Figure 2a). Analysis by competitive context (the moderator) of the simple slopes of the predictor shows that adolescents involved in competitive sports and exercises for body-related motives were significantly ($B = 1.98$, $SE = .67$, $p = .004$) more likely to present high levels of Vomiting–Purging Behaviours. Nevertheless, this interaction effect is non-significant for adolescents involved in non-competitive sports and exercises ($B = .67$, $SE = .53$, $p = .21$).

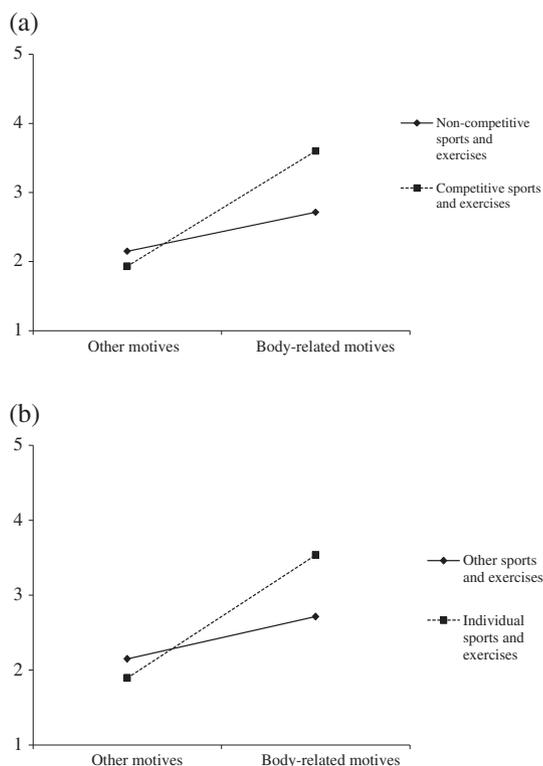


Figure 2 Vomiting–Purging Behaviour scores as a function of body-related motives, and (a) competition, and (b) individual sports and exercises

Finally, body-related sport and exercise motives significantly interact with involvement in the practice of individual sports and exercises in the prediction of Vomiting–Purging Behaviours ($p = .04$) and generic DEAB ($p = .01$). The simple slopes suggest that adolescents who practice an individual sport and exercise for body-related motives were significantly more likely to report higher levels of Vomiting–Purging Behaviours ($B = 1.95$, $SE = .66$, $p = .003$), but this effect is non-significant ($B = .67$, $SE = .53$, $p = .21$) for those involved in other sports and exercises (Figure 2b). However, the relations between body-related sport and exercise motives and generic DEAB remained non-significant in adolescents involved ($B = 5.41$, $SE = 3.23$, $p = .10$) or not ($B = -2.44$, $SE = 2.62$, $p = .35$) in individual sports and exercises, again because of an inversion of the sign across.

Discussion

The objective of this study was to determine whether: (i) body-related sport and exercise motives and DEAB were significantly interrelated and (ii) the relationship between body-related sport and exercise motives and DEAB differed according to gender and the types and contexts of sport and exercise.

Association between predictors and DEAB

Body-related motives

This research partially confirms previous results obtained among samples of adolescents (de Bruin et al., 2009; Furnham & Calnan, 1998; Furnham et al., 2002), indicating a significant and positive relationship between body-related sport and exercise motives and generic DEAB and Vomiting–Purging Behaviours. More precisely, the findings show that adolescents who exercise or practice sports for body-related motives tend to present higher levels of DEAB. This suggests that DEAB may be an additional method used by adolescents who exercise or practice sports to control their physique for an externally oriented (body-related) motive (e.g. Petrie & Greenleaf, 2012; Thompson & Sherman, 2010). Nevertheless, results also highlight that this relationship does not differ according to gender.

Gender and characteristics of sport and exercise

Additional results reveal that neither the degree of involvement in exercise or sport practice (i.e. weekly time or frequency) nor most of the sport-related characteristics (i.e. individual/team, competitive/non-competitive, or organized/non-organized) are in and of themselves significantly associated with DEAB. Moreover, they also reveal that this relationship does not differ according to gender, except for the generic DEAB subscale. These results contrast with previous studies (for reviews, see Petrie & Greenleaf, 2007, 2012) and show rather that practicing sports for body-related motives might explain the previously reported relationship between sport practice and DEAB. We must note, however, that this study considered only adolescents involved in sport and exercise, thus making it difficult to investigate the effects on DEAB of exercising and practicing, versus not exercising and practicing sports, a relationship that is otherwise quite well documented in the literature (e.g. Dossil, 2008; Petrie & Greenleaf, 2012; Thompson & Sherman, 2010).

Moderators of the association between body-related sport and exercise motives and DEAB

The objective of this study was to unpack the reasons underlying this troubling association. In this regard, subsequent analyses revealed that the relationship between body-related motives and DEAB may be amplified when adolescents practice individual and competitive sports and exercises. Therefore, these results highlight that certain types or contexts of sport and exercise may represent additional sources of sociocultural pressure to control one's physique and exacerbate the strength of the relationships between body-related motives and DEAB (Petrie & Greenleaf, 2012; Thompson & Sherman, 2010).

Individual sports and exercises

Our results showed that involvement in sport and exercise for body-related motives predicted higher levels of Vomiting–Purging Behaviours in adolescents involved in individual sports or exercises and do not generalize to those not involved in this type of practice. Indeed, many individual sports and exercise incorporate body-objectifying features (e.g. aesthetics, revealing uniforms or clothes), emphasize a lean body shape, reinforce the need to control body weight to succeed in the sport (e.g. dancing, figure skating, gymnastics) and exercise (e.g. fitness activities) or display participants' body shape, thus reinforcing social comparison processes (Haase, 2009; Prichard & Tiggemann, 2005). It is thus probable that individual sports and exercises expose adolescents with body-related motives to greater implicit and explicit interpersonal body weight and/or shape social comparisons and socio-cultural pressure, a situation that may amplify their desire to further control their physique. Consequently, if they doubt their ability to conform to their desired self-image through exercise or sport practice alone, the increased level of implicit and explicit pressure may push them to be significantly more relying on more extreme (Vomiting–Purging Behaviours) means of controlling their physique. Conversely, adolescents involved in team sports for body-related motives do not present higher levels of DEAB. This may be because team sports tend to focus less on body weight and/or shape, put less pressure on the need for extreme weight control as a condition of success and generally comprise fewer body-objectifying features than individual sports and exercises (Haase, 2009; Prichard & Tiggemann, 2005).

Competitive sports and exercises

Our results show that involvement in sport and exercise for body-related motives predicts higher levels of Vomiting–Purging Behaviours in adolescents who compete, but not in those who do not compete. It seems that in a competitive context, adolescents may implicitly or explicitly perceive higher levels of socio-cultural pressure to maximally control their body weight and/or shape in order to fine-tune their performance in their sport and exercise. Therefore, adolescents with body-related sport and exercise motives who are dissatisfied with their performance and doubt their ability to use sports and exercises alone to reach the sociocultural physical standards—which stem in part from the sport itself—seem more likely to rely on Vomiting–Purging Behaviours to reach their desired body weight and shape (Monthuy-Blanc, Maiano, Morin, & Stephan, 2012).

These results must thus be put into perspective as they showed a lack of relationship between body-related sport and exercise motives and Vomiting–Purging Behaviours in participants involved in non-competitive and team sports and exercises. In other words, this relationship seems to be limited to adolescents who practice individual and/or competitive sports and exercises, most likely for a combination of the reasons listed previously. Individual sports and exercises include body-objectifying features and pressure to control one's body weight and/or shape and the pressure to perform, which rises with the level of competition, may become increasingly difficult to manage simply through training and more conventional means (Prichard & Tiggemann, 2005). Because this is the first study, to our knowledge, to simultaneously examine the moderating effect of various types (leanness or individual) or contexts (organized or competitive) of sport and exercise on the relationship between body-related motives and DEAB, these results should be viewed as preliminary pending replication in future research.

Limitations of the present study

In fact, at least nine limitations must be considered when interpreting the findings. First, in this study, the adolescents reporting exercising or practicing sports for at least one body-related motive (out of three possible motives) were coded in the category of body-related motive. However, for those indicating two or three motives, no information on the ranking of their motives was available. It is thus probable that adolescents for whom body-related motives are only a minor (but still present) reason for engaging in sport and exercise were still included in this category. Consequently, this may have reduced power to detect differences between groups by making the body-related motive group more heterogeneous. It is thus important for future studies relying on similar methodology to ask the participants to rank their motives by degree of importance.

Second, no information was provided by the adolescents regarding the subdisciplines in which they were practicing their main sport and exercise. Yet, some sports (e.g. horse riding) include several subdisciplines (e.g. horse jumping or racing) in which body weight can be considered as more or less important for performance. Consequently, within a single sport, some subdisciplines could have been considered as leanness sports, but not other subdisciplines. For this reason, we may have underestimated the frequency of adolescents involved in leanness sports and exercises. It is thus fundamental for future research to more specifically ask participants to report the subdiscipline in which they are involved.

Third, this study relied on a cross-sectional design, precluding examination of the direction of the associations between body-related sport and exercise motives and DEAB. Consequently, it is unknown whether: (i) high levels of DEAB predict involvement in sports and exercise for body-related motives; (ii) body-related motives predict subsequent increases in DEAB levels; or (iii) both. Only a longitudinal design will provide clear answers to these questions. Fourth, in this study, only a small proportion (22%) of the adolescents reported exercising and practicing sports for a body-related motive. It is thus fundamental that this relationship be examined in the future among a larger sample of youth with body-related motives. Fifth, the interpersonal body weight/shape

comparisons and sociocultural pressure, which may explain the differences in the relationship between body-related motives and DEAB according to the types and contexts of sport and exercise, are relatively unknown and merit further exploration. Sixth, it is hypothesized that youth with body-related sport and exercise motives may engage in higher levels of DEAB when they doubt their ability to control their physique through exercise and sport practice alone. Consequently, adolescents' confidence in their ability to perform by controlling their physique through sports and exercises alone will likely moderate the relationship between body-related motives and DEAB. To our knowledge, this hypothesis has never been examined and should be the object of future research. Seventh, this study neglected to examine more pathogenic behaviours (i.e. dieting, vomiting, fasting, use of laxatives and/or diuretics, enemas, appetite suppressants) that adolescents could use to control their physique. Therefore, we do not know whether body-related sport and exercise motives are associated with the pathogenic weight-control behaviours in which adolescents engage or whether the types and contexts of sport and exercise are moderators of this relationship. If our interpretations hold, the results observed for the Vomiting–Purging Behaviours subscale should also hold for these more extreme means. These questions merit specific examination in future research. Eighth, it is also hypothesized that the relationship between body-related sport and exercise motives and DEAB could be moderated by the physical self-perceptions (e.g. physical condition, sport competence, flexibility) of adolescents involved in sport and exercise. This hypothesis has also never been examined and should be the object of future research. Finally, little is known about the beliefs of youth with body-related motives regarding sport and exercise as a means to attain their goal and their reasons for engaging in DEAB. These issues should be addressed in future research, particularly in qualitative studies.

Theoretical and practical implications

From a theoretical perspective, this study first confirms that body-related sport and exercise motives are significantly

associated with higher levels of generic DEAB and Vomiting–Purging Behaviours among adolescents. Additionally, our results show that this relationship does not differ according to gender. However, our findings on this topic are relatively limited and did not allow us to identify many correlates that may play a role in these relationships. Interestingly, our findings suggest that involvement in individual and competitive sports and exercises for body-related motives is significantly related to higher levels of Vomiting–Purging Behaviours. Nevertheless, these findings should be viewed as preliminary and need to be replicated, and the potential role of additional correlates need to be explored. For example, it would be interesting for future research to focus more specifically on the role of self-presentation concerns (i.e. social physique anxiety) or socio-contextual factors (parents, peers, coaches) in the relationships between body-related sport and exercise motives and DEAB.

From a practical perspective, it would be important for practitioners interested in the prevention or treatment of DEAB in adolescents involved in sport and exercise to take into consideration possible body-related motives for involvement. For example, preventive intervention should aim to encourage adolescents to become involved in sport and exercise for self-determined motives (e.g. social engagement and enjoyment) rather than for external motives (e.g. body-related). Additionally, the current findings suggest that practitioners may remain aware of the potentially risky effects of individual and competitive sports and exercises for adolescents who are exercising and practicing a sport for body-related motives.

Acknowledgements

Preparation of this article was supported in part from a grant from the Australian Research Council (DP140101559) awarded to Alexandre J. S. Morin.

REFERENCES

- Baum, A. (2006). Eating disorders in the male athlete. *Sports Medicine*, 36, 1–6.
- Brannan, M. E., & Petrie, T. A. (2011). Psychological well-being and the body dissatisfaction–bulimic symptomatology relationship: An examination of moderators. *Eating Behaviors*, 12, 233–241.
- Bratland-Sanda, S., & Sundgot-Borgen, J. (2013). Eating disorders in athletes: Overview of prevalence, risk factors and recommendations for prevention and treatment. *European Journal of Sport Science*, 13, 499–508.
- Byrne, S., & McLean, N. (2001). Eating disorders in athletes: A review of the literature. *Journal of Science and Medicine in Sport*, 4, 145–159.
- Chamay-Weber, C., Narring, F., & Michaud, P.-A. (2005). Partial eating disorders among adolescents: A review. *Journal of Adolescent Health*, 37, 417–427.
- Dawson, J. F., & Richter, A. W. (2006). Probing three-way interactions in moderated multiple regression: Development and application of a slope difference test. *Journal of Applied Psychology*, 91, 917–926.
- de Bruin, A. P., Woertman, L., Bakker, F. C., & Oudejans, R. R. D. (2009). Weight-related sport motives and girls' body image, weight control behaviors, and self-esteem. *Sex Roles*, 60, 628–641.
- Deci, E. L., & Ryan, R. M. (2000). The “What” and “Why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227–268.
- Dosil, J. (2008). *Eating disorders in athletes*. Chichester, United Kingdom: Wiley & Sons Ltd.
- Edwards, J. R., & Lambert, L. S. (2007). Methods for integrating moderation and mediation: A general analytical framework using moderated path analysis. *Psychological Methods*, 12, 1–22.
- Frederick, C. M., & Grow, V. M. (1996). A mediational model of autonomy, self-esteem and eating disordered attitudes and behaviors. *Psychology of Women Quarterly*, 20, 217–228.
- Furnham, A., Badmin, N., & Sneade, I. (2002). Body image dissatisfaction: Gender differences in eating attitudes, self-esteem and reasons for exercise. *Journal of Psychology*, 136, 581–596.
- Furnham, A., & Calnan, A. (1998). Eating disturbances, self-esteem, reasons for exercising and body weight dissatisfaction in adolescent males. *European Eating Disorders Review*, 6, 58–72.
- Garner, D. M., Garfinkel, P. E., Schwartz, D., & Thompson, M. (1980). Cultural expectations of thinness in women. *Psychological Reports*, 47, 483–491.
- Garner, D. M., Olmstead, M. P., Bohr, Y., & Garfinkel, P. E. (1982). The Eating Attitude Test: Psychometric features and clinical correlates. *Psychological Medicine*, 12, 871–878.
- Gonçalves, S. F., & Gomes, A. R. (2012). Exercising for weight and shape vs. health control reasons: The impact on eating disturbance and psychological functioning. *Eating Behaviors*, 13, 127–130.
- Haase, A. M. (2009). Physique anxiety and disordered eating correlates in female athletes: Differences in team and individual sports. *Journal of Clinical Sports Psychology*, 3, 218–231.
- Hausenblas, H. A., & Carron, A. (1999). Eating disorder indices and athletes: An integration. *Journal of Sport & Exercise Psychology*, 21, 230–258.
- Inglede, D. K., & Markland, D. (2008). The role of motives in exercise participation. *Psychology & Health*, 23, 807–828.
- Inglede, D. K., Markland, D., & Fergusson, E. (2009). Three levels of exercise motivation. *Applied Psychology: Health and Well-Being*, 1, 336–355.
- Kopp, L. L., & Zimmer-Gembeck, M. J. (2011). Women's global self-determination, eating regulation, and body dissatisfaction: Exploring the role of autonomy support. *Eating Behaviors*, 12, 222–224.

- Leong, S. L., Madden, C., Gray, A., & Horwath, C. (2012). Self-determined, autonomous regulation of eating behavior is related to lower body mass index in a nationwide survey of middle-aged women. *Journal of the Academy of Nutrition and Dietetics*, *112*, 1337–1346.
- Maiano, C., Morin, A. J. S., Lanfranchi, M.-C., & Therme, P. (2013). The Eating Attitudes Test-26 revisited using Exploratory Structural Equation Modeling (ESEM). *Journal of Abnormal Child Psychology*, *41*, 775–788.
- Markland, D., & Ingledew, D. K. (1997). The measurement of exercise motives: Factorial validity and invariance across gender of a revised Exercise Motivations Inventory. *British Journal of Health Psychology*, *2*, 361–376.
- Markland, D., & Ingledew, D. K. (2007). Exercise participation motives: A self-determination theory perspective. In Hagger, M. S., & Chatzisarantis, N. L. D. (Eds.), *Intrinsic motivation and self-determination in exercise and sport* (ed., pp. 23–34). Champaign, IL: Human Kinetics.
- Marsh, H. W., Hau, K.-T., Wen, Z., Nagengast, B., & Morin, A. J. S. (2012). Moderation. In Little, T. D. (Ed.), *Oxford handbook of quantitative methods* (ed., pp. 361–386). New York, NY: Oxford University.
- Martinsen, M., Bratland-Sanda, S., Eriksson, A. K., & Sundgot-Borgen, J. (2010). Dieting to win or to be thin? A study of dieting and disordered eating among adolescent elite athletes and non-athlete controls. *British Journal of Sports Medicine*, *44*(1), 70–76.
- Martinsen, M., & Sundgot-Borgen, J. (2013). Higher prevalence of eating disorders among adolescent elite athletes than controls. *Medicine & Science in Sports & Exercise*, *45*(6), 1188–1197.
- McCreary, D. R., & Sasse, D. K. (2000). An exploration of the drive for muscularity in adolescent boys and girls. *Journal of American College Health*, *48*, 297–304.
- McDonald, K., & Thompson, J. K. (1992). Eating disturbance, body image dissatisfaction, and reasons for exercising: Gender differences and correlational findings. *International Journal of Eating Disorders*, *11*, 289–292.
- Mond, J. M., Hay, P. J., Rodgers, B., & Owen, C. (2006). An update on the definition of “excessive exercise” in eating disorders research. *International Journal of Eating Disorders*, *39*, 147–153.
- Mond, J. M., Hay, P. J., Rodgers, B., Owen, C., & Beaumont, P. J. V. (2004). Relationships between exercise behaviour, eating-disordered behaviour and quality of life in a community sample of women: When is exercise ‘excessive’? *European Eating Disorders Review*, *12*, 265–272.
- Mond, J., Myers, T. C., Crosby, R., Hay, P., & Mitchell, J. (2008). ‘Excessive exercise’ and eating-disordered behaviour in young adult women: Further evidence from a primary care sample. *European Eating Disorders Review*, *16*, 215–221.
- Monthuy-Blanc, J., Maiano, C., Morin, A. J. S., & Stephan, Y. (2012). Physical self-concept and disturbed eating attitudes and behaviors in French athlete and non-athlete adolescent girls: Direct and indirect relations. *Body Image*, *9*, 373–380.
- Newsom, J. T., Prigerson, H. G., Schulz, R., & Reynolds, C. F. III (2003). Investigating moderator hypotheses in aging research: Statistical, methodological, and conceptual difficulties with comparing separate regressions. *International Journal of Aging & Human Development*, *57*, 119–150.
- Pelletier, L. G., & Dion, S. (2007). An examination of the general and specific motivational mechanisms for the relations between body dissatisfaction and eating behaviors. *Journal of Social and Clinical Psychology*, *26*, 303–333.
- Pelletier, L. G., Dion, S., & Lévesque, C. (2004a). Can self-determination help protect women against sociocultural influences about body image and reduce their risk of experiencing bulimic symptoms? *Journal of Social and Clinical Psychology*, *23*, 61–88.
- Pelletier, L. G., Dion, S., Slovinc-D’Angelo, M., & Reid, R. (2004b). Why do you regulate what you eat? Relationships between forms of regulation, eating behaviours, sustained dietary change and psychological adjustment. *Motivation and Emotion*, *28*, 245–277.
- Petrie, T. A., & Greenleaf, C. A. (2007). Eating disorders in sport: From theory to research to intervention. In Tenenbaum, G., & Eklund, R. (Eds.), *Handbook of sport psychology* (ed., pp. 352–378). Hoboken, NJ: Wiley.
- Petrie, T. A., & Greenleaf, C. A. (2012). Eating disorders in sport. In Murphy, S. (Ed.), *The Oxford handbook of sport and exercise psychology* (ed., pp. 635–659). New-York, NY: Oxford university press.
- Prichard, I., & Tiggemann, M. (2005). Objectification in fitness centers: Self-objectification, body dissatisfaction, and disordered eating in aerobic instructors and participants. *Sex Roles*, *53*, 19–28.
- Prichard, I., & Tiggemann, M. (2008). Relations among exercise type, self-objectification, and body image in the fitness centre environment: The role of reasons for exercise. *Psychology of Sport and Exercise*, *9*, 855–866.
- Ricciardelli, L. A., & McCabe, M. P. (2001). Children’s body image concerns and eating disturbance: A review of the literature. *Clinical Psychology Review*, *21*, 325–344.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *The American Psychologist*, *55*, 68–78.
- Ryan, R. M., Frederick, C. M., Lepes, D., Rubio, N., & Sheldon, K. M. (1997). Intrinsic motivation and exercise adherence. *International Journal of Sport Psychology*, *28*, 335–354.
- Silberstein, L. R., Striegel-Moore, R. H., Timko, C., & Rodin, J. (1988). Behavioral and psychological implications of body dissatisfaction: Do men and women differ? *Sex Roles*, *19*, 219–232.
- Smolak, L. (2004). Body image in children and adolescents: Where do we go? *Body Image*, *1*, 15–28.
- Smolak, L., Murnen, S., & Ruble, A. (2000). Female athletes and eating problems: A meta-analysis. *International Journal of Eating Disorders*, *27*, 371–380.
- Snoek, H. M., van Strien, T., Janssens, J. M. A. M., & Engels, R. C. M. E. (2008). Restrained eating and BMI. A longitudinal study among adolescents. *Health Psychology*, *27*, 753–759.
- Stice, E. (2002). Risk and maintenance factors for eating pathology. A meta-analytic review. *Psychology Bulletin*, *128*, 825–848.
- Stone-Romero, E. F., & Anderson, L. E. (1994). Relative power of moderated multiple regression and the comparison of subgroup correlation coefficients for detecting moderating effect. *Journal of Applied Psychology*, *79*, 354–359.
- Sundgot-Borgen, J., Meyer, N. L., Lohman, T. G., Ackland, T. R., Maughan, R. J., Stewart, A. D., et al. (2013). How to minimise the health risks to athletes who compete in weight-sensitive sports review and position statement on behalf of the Ad Hoc Research Working Group on Body Composition, Health and Performance, under the auspices of the IOC Medical Commission. *British Journal of Sports Medicine*, *47*, 1012–1022.
- Sungot-Borden, J. (1993). Prevalence of eating disorders in elite female athletes. *International Journal of Sport Nutrition*, *3*, 29–40.
- Thompson, R. A., & Sherman, R. T. (2010). *Eating disorders in sport*. New York, NY: Routledge.
- Torstveit, M. K., Rosenvinge, J. H., & Sungot-Borden, J. (2008). Prevalence of eating disorders and the predictive power of risk models in female elite athletes: A controlled study. *Scandinavian Journal of Medicine & Science in Sports*, *18*, 108–118.
- Torstveit, M. K., & Sungot-Borden, J. (2005). The female athlete triad: Are elite athletes at increased risk? *Medicine & Science in Sports & Exercise*, *37*, 184–193.
- Vartanian, L. R., Wharton, C. M., & Geen, E. B. (2012). Appearance vs. health motives for exercise and for weight loss. *Psychology of Sport and Exercise*, *13*, 251–256.
- Verstuyf, J., Patrick, H., Vansteenkiste, M., & Teixeira, P. (2012). Motivational dynamics of eating regulation: A self-determination theory perspective. *International Journal of Behavioral Nutrition and Physical Activity*, *9*, 21.
- Vinkers, C. D. W., Evers, C., Adriaanse, M. A., & de Ridder, D. T. D. (2012). Body esteem and eating disorder symptomatology: The mediating role of appearance-motivated exercise in a non-clinical adult female sample. *Eating Behaviors*, *13*, 214–218.