



Contents lists available at [SciVerse ScienceDirect](http://www.sciencedirect.com)

## Body Image

journal homepage: [www.elsevier.com/locate/bodyimage](http://www.elsevier.com/locate/bodyimage)



# Physical self-concept and disturbed eating attitudes and behaviors in French athlete and non-athlete adolescent girls: Direct and indirect relations

Johana Monthuy-Blanc<sup>a,\*</sup>, Christophe Maïano<sup>b</sup>, Alexandre J.S. Morin<sup>c,d</sup>, Yannick Stephan<sup>e</sup>

<sup>a</sup> Department of Education Sciences, University of Québec in Trois-Rivières, Trois-Rivières, Québec, Canada

<sup>b</sup> Cyberpsychology Laboratory, Department of Psychoeducation and Psychology, University of Quebec in Outaouais, Saint-Jérôme, Québec, Canada

<sup>c</sup> Department of Psychology, University of Sherbrooke, Sherbrooke, Québec, Canada

<sup>d</sup> Centre for Positive Psychology and Education, University of Western Sydney, Sydney, Australia

<sup>e</sup> "Sport and Social Environment" Research Laboratory (EA 3742), University Joseph Fourier, Grenoble, France

### ARTICLE INFO

#### Article history:

Received 4 April 2011

Received in revised form 9 April 2012

Accepted 20 April 2012

#### Keywords:

Ballet

Basketball

Body dissatisfaction

Bulimia

Drive for thinness

Eating Disorder Inventory

Physical Self-Inventory

### ABSTRACT

This study aims to investigate the direct and indirect associations between physical self-subdomains, physical self-worth, global self-worth, and disturbed eating attitudes and behaviors among French non-elite athlete and non-athlete adolescent girls. A sample of adolescent girls including 50 ballet dancers, 41 basketball players, and 47 non-athletes was used in this study. Data obtained from the ballet dancer and basketball player subsamples revealed significant, sample-specific as well as common, direct relations between global and physical self-perceptions and disturbed eating attitudes and behaviors, as well as significant indirect relations (via global self-worth and physical self-worth) between specific physical self-perceptions and disturbed eating attitudes and behaviors. In contrast, no association was found between global and physical self-perceptions in the sample of non-athlete adolescent girls.

© 2012 Elsevier Ltd. All rights reserved.

### Introduction

The physical self-concept is a multidimensional and hierarchical construct (Fox & Corbin, 1989, see Fig. 1). The upper level of this hierarchical model is occupied by global self-worth (i.e., positive or negative way people feel about themselves as a whole). The next level (the domain level) is occupied by a global construct representing physical self-worth (i.e., general feelings of happiness, satisfaction, and pride in the physical self). Finally, the lower level (the sub-domain level) is occupied by four constructs: sport competence (i.e., athletic ability and ability to learn sports), physical condition (i.e., stamina and fitness), physical attractiveness (i.e., physical appearance and remaining attractive over time), and physical strength (i.e., perceived strength and muscle development).

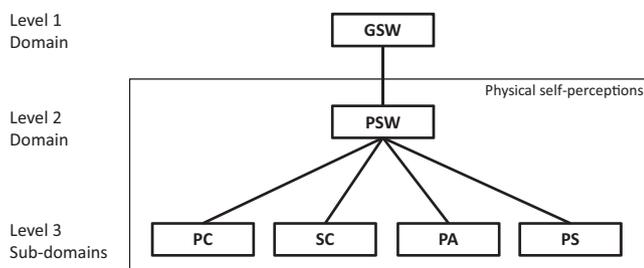
According to Sonstroem and Morgan's (1989) extension of this model to sport practice, the associations between physical self-concept components follow *bottom-up* directions. In other words, the relations go from the subdomains (e.g., sport competence,

physical appearance), themselves predicted by sport participation, to the more global domains (i.e., global self-worth and physical self-worth; also see Fox, 2000; Sonstroem, Harlow, & Josephs, 1994; Thøgersen, Fox, & Ntoumanis, 2002). Previous research generally confirmed all, or part of, these propositions (e.g., Baldwin & Courneya, 1997; Bowker, 2006; Morin, Maïano, Marsh, Janosz, & Nagengast, 2011; Scalas & Marsh, 2008; Sonstroem, Speliotis, & Fava, 1992; Sonstroem et al., 1994; Thøgersen et al., 2002).

Results from meta-analyses reported that sport participation had a positive effect on physical self-perceptions and on the psychological well-being of adolescents (Ekeland, Heian, & Hagen, 2005; Fox, 2000; Hausenblas & Fallon, 2006). More precisely, Marsh and colleagues (Marsh, Chanal, & Sarrazin, 2006; Marsh & Craven, 2006; Marsh, Gerlach, Trautwein, Lüdtke, & Brettschneider, 2007; Marsh, Papaioannou, & Theodorakis, 2006; Marsh & Perry, 2005) showed that physical self-perceptions and sport performance are mutually related and reinforce each other, so that positive physical self-conceptions are a pre-requisite to performance. Conversely, epidemiological studies, conducted mostly with girls, showed that disturbed eating attitudes and behaviors were significantly more prevalent among regular elite athletes (specifically those involved in sports emphasizing leanness, thinness, and aesthetic aspects) than in non-athletes. These rates range from 18.3% to 37.7% for athletes to 0% to 11.1% for non-athletes (e.g., Anshel, 2004; Ferrand, Champely, & Filaire, 2009; Filaire, Rouveix, Bouget, & Pannafieux,

\* Corresponding author at: Department of Education Sciences, 3351 boul. des Forges, CP 500, Trois-Rivières, Québec, Canada G9A 5H7. Tel.: +1 819 376 5011; fax: +1 819 376 5127.

E-mail address: [Johana.Monthuy-Blanc@UQTR.CA](mailto:Johana.Monthuy-Blanc@UQTR.CA) (J. Monthuy-Blanc).



**Fig. 1.** Fox and Corbin's (1989) conception of the physical self-concept. Note. GSW = Global Self-Worth; PA = Physical Attractiveness; PC = Physical Condition; PS = Physical Strength; PSW = Physical Self-Worth; SC = Sport Condition.

2007; Neumärker, Bettel, Bettel, Dudeck, & Neumärker, 1998; Rouveix, Bouget, Pannafieux, Champely, & Filaire, 2007).

One explanation for the increased rates of disturbed eating attitudes and behaviors observed in sports emphasizing leanness, thinness, and aesthetics, is that athletes may see these dysfunctional attitudes and behaviors as an efficient way to control their body weight/fat to the level required to reach optimal levels of performance in their sports (Bonci et al., 2008; de Bruin, Bakker, & Oudejans, 2009; de Bruin, Oudejans, & Bakker, 2007; Ferrand et al., 2009; Sangenis, Drinkwater, Loucks, Sherman, Sundgot-Borgen, & Thompson, 2005; Scoffier, Maïano, & d'Arripe-Longueville, 2010). Not surprisingly, at elite levels, the competitive nature of these sports tends to create unhealthy body-comparison tendencies (Sangenis et al., 2005) that may interact in a mutually reinforcing manner with specific factors from the sports environment (see Petrie & Greenleaf, 2007). It is thus probable that adolescent girl athletes who perceive themselves as less efficient in their sports, who doubt their physical abilities (e.g., physical condition, physical strength), or who are unsure of their capabilities to control their weight via healthy methods, may decide to seek extreme means of controlling their body weight/fat, and thus improve their performance. Nevertheless, as indicated by Bonci et al. (2008, p. 83), this "intensified pressure to attain or maintain an ideal body weight or body fat percentage is not necessarily inherent in the activity itself but in the athlete's perception of what is required for optimizing performance."

In line with these observations, a handful of studies recently examined the relations between global self-worth, physical self-perceptions, and disturbed eating attitudes and behaviors among adolescent girl athletes (de Bruin et al., 2007; Ferrand, Magnan, & Antonini, 2005; Ferrand, Magnan, Rouveix, & Filaire, 2007; Ferrand et al., 2009; Filaire et al., 2007; Monsma & Malina, 2004; Rouveix et al., 2007; Scoffier et al., 2010). Only two of these studies included global self-worth and they reported conflicting results. Monsma and Malina (2004) showed a significant relation between global self-worth and disturbed eating attitudes, and behaviors, whereas Ferrand et al. (2009) reported a negative relation between these constructs. The observation that so few studies considered the relation between these constructs in athletes is highly surprising, as well as their conflicting results, since the relation between global self-worth, and disturbed eating attitudes and behaviors is well documented in non-athlete populations (de Bruin et al., 2007; Ferrand et al., 2005, 2007, 2009; Filaire et al., 2007; Monsma & Malina, 2004; Rouveix et al., 2007; Scoffier et al., 2010).

Although all eight of the reviewed studies examined the relations between physical self-perceptions, and disturbed eating attitudes and behaviors, they mainly focused on physical attractiveness, rather than on a multidimensional conception of physical self-perceptions. Once again, these studies report mixed results. First, six studies reported significant relations between physical attractiveness, and disturbed eating attitudes and behaviors in aesthetic sports (de Bruin et al., 2007; Ferrand et al., 2005, 2009; Filaire et al., 2007; Monsma & Malina, 2004; Rouveix et al., 2007).

Conversely, two studies (Ferrand et al., 2007; Scoffier et al., 2010) report non-significant relations between these constructs. Additionally, two studies considered more specifically the relations between disturbed eating attitudes and behaviors, and other sub-domains. One of those studies found a significant relation between physical condition and disturbed eating attitudes and behaviors (Monsma & Malina, 2004), while the other found a non-significant relation between sport competence and disturbed eating attitudes and behaviors (Scoffier et al., 2010).

These previous studies present at least four major limitations. First, none examined the relation between physical self-perceptions, global self-worth and disturbed eating attitudes and behaviors while taking into account Fox and Corbin's (1989) multidimensional perspective and Sonstroem and Morgan's (1989) bottom-up hypothesis. Second, except for Monsma and Malina (2004), most of the reviewed studies considered either a single indicator, such as dieting restraint, or a global indicator of disturbed eating attitudes and behaviors. It is thus unclear whether global self-worth and physical self-perceptions may be differentially related to distinct facets of disturbed eating attitudes and behaviors, such as bulimia and body dissatisfaction (e.g., Torstveit & Sundgot-Borgen, 2005). Third, only one study (Ferrand et al., 2005) contrasted athletes engaged in aesthetic/leanness sports, athletes engaged in non-aesthetic/leanness sports, and a group of non-athletes. Although this study showed that global self-worth and physical self-perceptions were more strongly related to disturbed eating attitudes and behaviors in aesthetic/leanness sports, this conclusion needs to be replicated. Fourth, most of the studies relied solely on elite-level samples, engaged in a highly competitive athletic environment, thus neglecting the far more common non-elite level of athletic sport participation (Rosendahl, Bormann, Aschenbrenner, & Strauss, 2008). Consequently, it is currently unknown whether the previously cited results generalize to a less competitive or extreme sport context.

This study aims to investigate the direct and indirect associations between subdomain-specific physical self-perceptions as predictors, global physical self-worth and global self-worth as intermediate variables (i.e., mediators), and disturbed eating attitudes and behaviors as outcomes. These possibilities will be verified among non-elite adolescent girls competing in leanness (ballet) or non-leanness (basketball) sports, and among non-athlete adolescent girls. Following Sonstroem and Morgan (1989), we postulate that these indirect associations will follow a *bottom-up* direction, going from subdomain-specific physical self-perceptions to disturbed eating attitudes and behaviors, via global physical self-worth or global self-worth. Although previous studies confirmed this proposal when looking at the relations between subdomain-specific and global physical self-perceptions (e.g., Bowker, 2006; Morin et al., 2011; Scalas & Marsh, 2008; Sonstroem et al., 1992, 1994; Thøgersen et al., 2002), the extension of this bottom-up hypothesis to the relations between physical self-perceptions, and disturbed eating attitudes and behaviors is also consistent with etiological theories of eating disorders. Indeed, these theories and related research identify global self-worth, but not necessarily subdomain-specific physical self-perceptions, as an important proximal precursor of disturbed eating attitudes and behaviors (e.g., Button, Loan, Davies, & Sonuga-Barke, 1997; Button, Sonuga-Barke, Davies, & Thompson, 1996; Monthuy-Blanc, Morin, Puzé, & Ninot, 2012; Paxton, Eisenberg, & Neumark-Sztainer, 2006; van den Berg, Thompson, Obremski-Brandon, & Coovert, 2002).

More specifically, two hypotheses can be formulated. Based on Ferrand et al.'s (2005) results, the first hypothesis proposes that the direct relation between global and physical self-perceptions, and disturbed eating attitudes and behaviors will be stronger for athletes competing in aesthetic/leanness sports than in non-aesthetic/leanness sports, or for non-athletes. The second

**Table 1**

Descriptive statistics for the three subsamples.

Demographic/anthropometric characteristics		M (SD)			$\chi^2(2)^\ddagger$	$\eta^2$
		Ballet (n = 50)	Basketball (n = 41)	Non-athletes (n = 47)		
Age [years]		14.60 (1.26)	13.59 (1.32) <sup>Δ</sup>	14.13 (1.28)	12.70**	.09
Weight [kg]		51.08 (7.11)	53.54 (12.99)	51.70 (5.67)	0.80	.01
Height [m]		1.62 (0.06)	1.65 (0.10)	1.64 (0.06)	2.11	.02
Body mass index [kg/m <sup>2</sup> ]		19.31 (2.18)	19.42 (3.45)	19.13 (1.72)	0.84	.01
Training/years of practice		M (SD)			Z	$\eta^2$
		Ballet (n = 50)	Basketball (n = 41)	Non-athletes (n = 47)		
Weekly training time [h]		4.10 (1.16)	4.05 (0.84)	NA	-0.60	.004
Years of sport practice [years]		3.78 (0.76)	3.93 (0.85)		-0.80	.007
EDI scales		M (SD)			$\chi^2(2)^\ddagger$	$\eta^2$
		Ballet (n = 50)	Basketball (n = 41)	Non-athletes (n = 47)		
Bulimia	.79 <sup>a</sup> , .83 <sup>b</sup> , .75 <sup>c</sup> , .77 <sup>d</sup>	1.82 (2.54)	1.68 (2.43)	2.28 (2.64)	2.73	.02
Drive for Thinness	.85, .90, .74, .84	7.60 (7.06)	5.34 (4.80)	4.77 (5.27)	2.97	.02
Body Dissatisfaction	.83, .84, .82, .81	10.28 (7.33)	8.27 (6.62)	8.32 (6.60)	2.77	.02
PSI-S scales		M (SD)			F(2,135)	$\eta_p^2$
		Ballet (n = 50)	Basketball (n = 41)	Non-athletes (n = 47)		
Global Self-Worth	.83, .90, .64, .85	3.52 (1.32)	3.65 (1.04)	3.48 (1.34)	0.22	.003
Physical Self-Worth	.78, .75, .76, .81	3.49 (0.98)	3.76 (0.96)	3.28 (1.06)	2.43	.04
Physical Condition	.83, .81, .75, .90	2.33 (1.12)	2.95 (1.28)	2.49 (1.43)	2.81	.04
Sport Competence	.91, .91, .85, .91	3.01 (1.19)	3.65 (0.98) <sup>†</sup>	2.85 (1.21)	5.92**	.008
Physical Attractiveness	.81, .82, .77, .83	3.59 (1.17)	3.66 (1.01)	3.54 (1.22)	0.12	.002
Physical Strength	.79, .79, .73, .79	2.34 (1.07)	3.20 (1.13) <sup>†</sup>	2.51 (1.11)	7.56**	.10

Note. M = Mean; SD = Standard deviation; NA = not available; PSI-S = Physical Self-Inventory-short form; EDI = Eating Disorders Inventory; MANOVA = multivariate ANOVA;  $\alpha$  = Cronbach's alpha; Z = Mann-Whitney U test.

<sup>a</sup> Total sample.

<sup>b</sup> Ballet dancers.

<sup>c</sup> Basketball players.

<sup>d</sup> Non-athletes.

\*\*  $p < .01$ .

<sup>†</sup> Significantly higher than the other groups.

<sup>‡</sup> Kruskal-Wallis H test.

<sup>Δ</sup> Significantly lower than the other groups.

hypothesis proposes that the relation between subdomain-specific physical self-perceptions and disturbed eating attitudes and behaviors will be indirect and mediated by global physical self-worth and global self-worth.

## Method

### Participants and Procedure

After receiving the authorization from 19 non-elite clubs/dance schools and one high-school located in Southern France, a total of 172 French adolescent girls between the ages of 12 and 16 years were presented with an informed consent form for minors (requesting them to obtain parental consent) and a letter explaining the purposes of the study. Evidence from the preceding literature review does not lead us to expect that France would differ in any way from other developed countries in regards to the estimated relations. The overall sample comprised three subsamples. The first two subsamples included 60 ballet dancers and 48 basketball players who practice their sport in a non-elite context, between 3 and 6 h per week, and compete at the district or inter-district level. The third subsample included 64 adolescents involved in physical education classes, but never in any organized sport.

Data collection was conducted at the end of a training period for athletes, or during high-school physical education classes for non-athletes. Of those, 50 (83%) ballet dancers, 41 (85%) basketball players, and 47 (73%) non-athletes could be included in the study. The remaining 34 girls were not included because they either (a) refused to participate (3 ballet dancers, 1 basketball player, and

4 non-athletes); (b) omitted to return the consent form signed by their parents (2 ballet dancers, 2 basketball players, and 5 non-athletes); (c) failed to complete the questionnaires (5 ballet dancers, 4 basketball players, and 7 non-athletes); or (d) presented chronic health problems (e.g., diabetes, 1 non-athlete).

### Measures

**Demographic and anthropometric characteristics.** In this questionnaire the participants were asked to provide information on (a) their age, (b) whether they actually have health problems, (c) the practice location for the target sport (in a club, a dance school, the high school, or independent practice), (d) the number of hours of training per week for the target sport, and (e) the number of years of practice in the target sport. Participants were also weighed and measured without shoes. The height (m) and weight (kg) were then converted to a body mass index = weight (kg)/height (m)<sup>2</sup>. The anthropometric and demographic characteristics of the participants are reported in Table 1.

**Disturbed eating attitudes and behaviors.** Participants were assessed with the French version of the Eating Disorders Inventory (EDI; Criquillon-Doublet, Divac, Dardennes, & Guelfi, 1995; Garner, Olmsted, & Polivy, 1983). The full 64-item EDI-I assessed disturbed eating attitudes and behaviors such as Body Dissatisfaction (BD), Bulimia (BU), Drive for Thinness (DT), and related personality characteristics (Ineffectiveness, Perfectionism, Interpersonal Distrust, Interoceptive Awareness, Maturity Fears). In this questionnaire the participants answered each item using a 4-point scale ranging from 0 (the least symptomatic answer) through 3 (the

**Table 2**  
 Correlations between variables in the three subsamples.

Variables	1	2	3	4	5	6	7	8
1—Bulimia	—							
2—Drive for Thinness	.55 <sup>**a</sup> .12 <sup>b</sup> .17 <sup>c</sup>	—						
3—Body Dissatisfaction	.47 <sup>**a</sup> .44 <sup>**b</sup> .39 <sup>**c</sup>	.80 <sup>**a</sup> .57 <sup>**b</sup> .63 <sup>**c</sup>	—					
4—Global Self-Worth	-.48 <sup>**a</sup> -.47 <sup>**b</sup> .14 <sup>c</sup>	-.42 <sup>**a</sup> -.51 <sup>**b</sup> -.03 <sup>c</sup>	-.40 <sup>**a</sup> -.63 <sup>**b</sup> -.09 <sup>c</sup>	—				
5—Physical Self-Worth	-.48 <sup>**a</sup> -.34 <sup>**b</sup> .26 <sup>c</sup>	-.42 <sup>**a</sup> -.07 <sup>b</sup> .21 <sup>c</sup>	-.42 <sup>**a</sup> -.27 <sup>b</sup> .02 <sup>c</sup>	.70 <sup>**a</sup> .30 <sup>b</sup> .59 <sup>**c</sup>	—			
6—Physical Condition	-.28 <sup>a</sup> .05 <sup>b</sup> .14 <sup>c</sup>	-.27 <sup>a</sup> -.17 <sup>b</sup> -.03 <sup>c</sup>	-.21 <sup>a</sup> -.42 <sup>**b</sup> .01 <sup>c</sup>	.32 <sup>**a</sup> .23 <sup>b</sup> .29 <sup>*c</sup>	.54 <sup>**a</sup> .34 <sup>**b</sup> .49 <sup>**c</sup>	—		
7—Sport Competence	-.21 <sup>a</sup> -.16 <sup>b</sup> .08 <sup>c</sup>	-.34 <sup>**a</sup> .04 <sup>b</sup> .04 <sup>c</sup>	-.35 <sup>**a</sup> -.24 <sup>b</sup> -.11 <sup>c</sup>	.25 <sup>a</sup> .14 <sup>b</sup> .30 <sup>*c</sup>	.62 <sup>**a</sup> .72 <sup>**b</sup> .77 <sup>**c</sup>	.62 <sup>**a</sup> .33 <sup>**b</sup> .56 <sup>**c</sup>	—	
8—Physical Attractiveness	-.03 <sup>a</sup> -.23 <sup>b</sup> -.03 <sup>c</sup>	-.18 <sup>a</sup> -.36 <sup>**b</sup> -.04 <sup>c</sup>	-.38 <sup>**a</sup> -.50 <sup>**b</sup> -.35 <sup>**c</sup>	.01 <sup>a</sup> .47 <sup>**b</sup> .56 <sup>**c</sup>	.004 <sup>a</sup> .42 <sup>**b</sup> .54 <sup>**c</sup>	-.05 <sup>a</sup> .13 <sup>b</sup> .35 <sup>**c</sup>	.16 <sup>a</sup> .24 <sup>b</sup> .35 <sup>**c</sup>	—
9—Physical Strength	.07 <sup>a</sup> -.05 <sup>b</sup> .09 <sup>c</sup>	-.01 <sup>a</sup> .26 <sup>b</sup> .20 <sup>c</sup>	.01 <sup>a</sup> .11 <sup>b</sup> .05 <sup>c</sup>	-.02 <sup>a</sup> -.17 <sup>b</sup> -.03 <sup>c</sup>	.20 <sup>a</sup> .45 <sup>**b</sup> .06 <sup>c</sup>	.32 <sup>**a</sup> .08 <sup>b</sup> -.03 <sup>c</sup>	.58 <sup>**a</sup> .48 <sup>**b</sup> .19 <sup>c</sup>	.13 <sup>a</sup> .01 <sup>b</sup> .19 <sup>c</sup>

<sup>a</sup> Correlation values for the ballet dancers.  
<sup>b</sup> Correlation values for the basketball players.  
<sup>c</sup> Correlation values for the non-athletes.  
<sup>\*</sup>  $p < .05$ .  
<sup>\*\*</sup>  $p < .01$ .

most symptomatic answer). In this study only the disturbed eating attitudes and behaviors subscales were used (23 items).

**Global self-worth and physical self-perceptions.** Participants' global self-worth and physical self-perceptions were assessed with the short form of the Physical Self-Inventory (PSI-S; Maïano et al., 2008; Morin & Maïano, 2011). This French instrument includes 18 items (3 per dimension) and measures all dimensions from the Fox and Corbin (1989) model (see Fig. 1). This instrument was validated and cross-validated (Maïano et al., 2008; Morin & Maïano, 2011) among a total sample of 3047 French adolescents aged between 11 and 18 years. Participants answered each item on a 6-point Likert scale ranging from *not at all* (1) to *entirely* (6).

**Data Analysis**

Cronbach alpha coefficients for all measures are reported in Table 1 and are in the acceptable range for all sub-samples. The demographic and anthropometric characteristics of the three sub-samples (basketball players, ballet dancers, and non-athletes) were compared using a series of Kruskal–Wallis *H* tests. Non-parametric tests were chosen due to the significant non-normality of the variables being compared. Regarding the multiple Kruskal–Wallis *H* tests that were conducted, a Bonferroni correction was applied to avoid the inflation of Type I errors. The alpha error rate (.05) was thus divided by 3 (3 comparisons were made: weight, height, and body mass index), and set at .02. Additionally, the weekly training time and years of practice of the ballet dancers and basketball players were compared using Mann–Whitney *U* tests. A Bonferroni correction was also applied, and the alpha error was set at .03 (.05/2). Then, the difference between the three subsamples on the BU, DT, and BD subscales, and on all dimensions of global and physical self-perceptions were respectively tested using a series of Kruskal–Wallis *H* tests and a multivariate ANOVA (MANOVA). A Bonferroni correction was again applied to the Kruskal–Wallis *H* tests (.05/3 = .02).

Finally, the relations between global and physical self-perceptions and disturbed eating attitudes and behaviors were examined with correlations and multiple regressions. Baron and Kenny (1986) stated that indirect effects implies that (a) the predictor (P) is significantly associated to the outcome (O; the  $\tau$  path); (b) P is significantly associated with the intermediate variable or mediator (M; the  $\alpha$  path); (c) M is significantly associated with O (the  $\beta$  path); and (d) the P–O relation is significantly reduced when M is simultaneously in the equation (the new P–O relation is called  $\tau'$  and thus this condition states that  $\tau' < \tau$ ). It has since been recognized that the first of these steps is superfluous (Fritz & MacKinnon, 2007; Kenny, 2008; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

The significance of an indirect effect can be verified using two different methods: (a) verifying that  $\tau - \tau'$  significantly differs from zero, and (b) verifying that  $\alpha^*\beta$  significantly differs from zero. Recent studies comparing the effectiveness of the most common methods used for verifying indirect effects concluded that the second method ( $\alpha^*\beta$ ) was generally more effective (MacKinnon et al., 2002). Moreover, given the frequent asymmetry of theoretical distributions of  $\alpha^*\beta$ , verifying their significance through bootstrapped 95% confidence intervals is also recommended (Kenny, 2008; MacKinnon, Lockwood, & Williams, 2004). Bootstrapping relies on a resampling strategy in which a large number of samples (5000 in this study) of a size equivalent to the original one are derived from the original data by sampling with replacement. The indirect effect ( $\alpha^*\beta$ ) is then separately computed in each of the bootstrapped samples to derive a new empirical  $\alpha^*\beta$  distribution (Preacher & Hayes, 2008). From the resulting distribution, a confidence interval (95% in this case) around the indirect effect ( $\alpha^*\beta$ ) can be constructed. If this interval excludes zero, the indirect effect obtained can be considered to significantly differ from zero. This method is particularly helpful in small samples, as is the case herein. In this study, bootstrapped confidence intervals were computed with the macro developed by Preacher and Hayes (2008), and available on the quantpsy.org website.

Results

Preliminary Analyses

Demographic characteristics of the three samples were contrasted and the results, presented in Table 1, show that they significantly differ on (a) age: the ballet dancers and non-athletes are, on average, older than the basketball players; and (b) some physical self-concept subscales: the ballet dancers and non-athletes scored, on average, lower than basketball players on the Sport Competence and the Physical Strength subscales. The three samples did not significantly differ from one another on any of the disturbed eating attitudes and behaviors, or on the remaining demographic characteristics (i.e., weight, height, body mass index, training time, and years of practice for the target sport).

Analyses of Indirect Effects

The correlations analyses are reported in Table 2, and the results from the significant indirect effects are reported in Table 3. In the indirect effects analyses, only the relations going from the physical self subscales (Physical Condition, Sport Competence, Physical Attractiveness, and Physical Strength) to the disturbed eating attitudes and behaviors scales (BU, DT, and BD), with either Global Self-Worth or Physical Self-Worth scales as the intermediate variable, were tested. These tests were performed with one subdomain, one intermediate variable, and one outcome at a time. However, these tests were only performed when the preliminary correlations confirmed that the subdomain was significantly associated with the intermediate variable in the first place. These indirect effects were also computed with additional controls (e.g., age) and converge on quasi-identical results. To maximize the statistical power of the analyses, we report the results from the analyses without controls.

**Ballet dancers.** The correlations between the physical self-perceptions and the BU, DT, and BD scales scores among the ballet dancers reveal that (a) only Physical Condition is significantly and positively correlated to Global Self-Worth; (b) Physical Condition and Sport Competence are significantly and positively correlated to Physical Self-Worth; (c) Global Self-Worth and Physical Self-Worth are significantly and negatively correlated to BU, DT, and BD; and (d) Sport Competence is significantly and negatively correlated to DT and BD. The results from the indirect effects reveal that (a) the effects of Physical Condition on BU, DT, and BD are significantly mediated by Global Self-Worth and Physical Self-Worth; and (b) the effects of Sport Competence on BU and DT are significantly mediated by Physical Self-Worth.

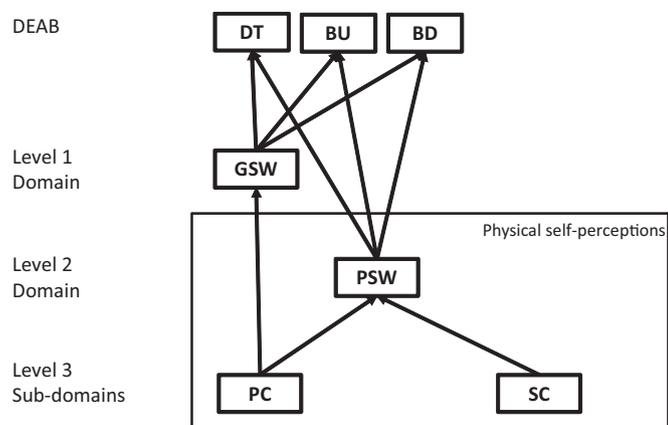
For each significant indirect effect, the relation between physical self-subdomain and Global Self-Worth or Physical Self-Worth is positive, and the relation between Global Self-Worth or Physical Self-Worth and BU, DT, or BD is negative. More precisely, these results show that the negative effects of these specific physical self-perceptions on disturbed eating attitudes and behaviors were fully mediated global self-perceptions, such that increased levels of Physical Condition and Sport Competence predicted increased levels of Global Self-Worth and Physical Self-Worth, which in turn predicted lower levels of BU, DT, and BD. These results are synthesized in Fig. 2.

**Basketball players.** The correlations between the physical self-perceptions and the BU, DT, and BD scales scores among the basketball players reveal that (a) only Physical Attractiveness is significantly and positively correlated to Global Self-Worth; (b) Physical Condition, Sport Competence, Physical Attractiveness, and Physical Strength are significantly and positively correlated to Physical Self-Worth; (c) Global Self-Worth and Physical Self-Worth are significantly and negatively correlated to BU; (d) Global Self-Worth and Physical Attractiveness are significantly and negatively

Table 3  
 Significant indirect effects.

Sample	Predictor (P)	Mediator (M)	Outcome (O)	Path P→M Coef. (SE)	Path M→O Coef. (SE)	Path P→O (no control for M) Coef. (SE)	Path P→O (control for M) Coef. (SE)	Indirect effect Coef. (CI)	R <sup>2</sup>
Ballet	PC	GSW	BU	0.38 (0.16)*	-0.85 (0.26)*	-0.62 (0.31)	-0.30 (0.30)	-0.32 (-0.77 -0.03)*	.25
Ballet	PC	GSW	DT	0.38 (0.16)*	-1.97 (0.74)*	-1.72 (0.87)	-0.97 (0.87)	-0.75 (-1.94 -0.02)*	.20
Ballet	PC	GSW	BD	0.38 (0.16)*	-2.02 (0.78)*	-1.37 (0.92)	-0.60 (0.92)	-0.77 (-2.04 -0.01)*	.16
Ballet	PC	PSW	BU	0.47 (0.11)*	-1.23 (0.39)*	-0.62 (0.31)	-0.05 (0.34)	-0.58 (-1.25 -0.15)*	.23
Ballet	PC	PSW	DT	0.47 (0.11)*	-2.75 (1.13)*	-1.72 (0.87)	-0.43 (0.99)	-1.29 (-2.57 -0.38)*	.18
Ballet	PC	PSW	BD	0.47 (0.11)*	-3.24 (1.18)*	-1.37 (0.92)	-0.15 (1.02)	-1.52 (-2.82 -0.57)*	.18
Ballet	SC	PSW	BU	0.51 (0.09)*	-1.48 (0.42)*	-1.48 (0.42)	0.30 (0.34)	-0.75 (-1.44 -0.27)*	.25
Ballet	SC	PSW	DT	0.51 (0.09)*	-2.44 (1.21)*	-1.99 (0.80)*	-0.77 (0.99)	-1.23 (-2.52 -0.19)*	.19
Basketball	PA	GSW	BU	0.49 (0.15)*	-1.09 (0.38)*	-0.56 (0.38)	-0.03 (0.39)	-0.53 (-1.17 -0.06)*	.22
Basketball	PA	GSW	DT	0.49 (0.15)*	-2.03 (0.72)*	-1.69 (0.71)*	-0.70 (0.75)	-0.99 (-2.09 -0.23)*	.28
Basketball	PA	GSW	BD	0.49 (0.15)*	-3.22 (0.87)*	-3.24 (0.91)*	-1.67 (0.90)	-1.57 (-3.03 -0.36)*	.44
Basketball	PC	PSW	BU	0.25 (0.11)*	-1.02 (0.40)*	0.10 (0.30)	0.35 (0.30)	-0.26 (-0.70 -0.05)*	.15
Basketball	SC	PSW	BU	0.71 (0.11)*	-1.21 (0.56)*	-0.39 (0.39)	0.47 (0.55)	-0.86 (-1.98 -0.20)*	.13
Basketball	PS	PSW	BU	0.39 (0.12)*	-1.02 (0.43)*	-0.10 (0.34)	0.30 (0.36)	-0.39 (-1.03 -0.09)*	.13
Basketball	PS	PSW	BD	0.39 (0.12)*	-2.75 (1.16)*	-0.67 (0.93)	-1.73 (0.99)	-1.06 (-2.66 -0.17)*	.14

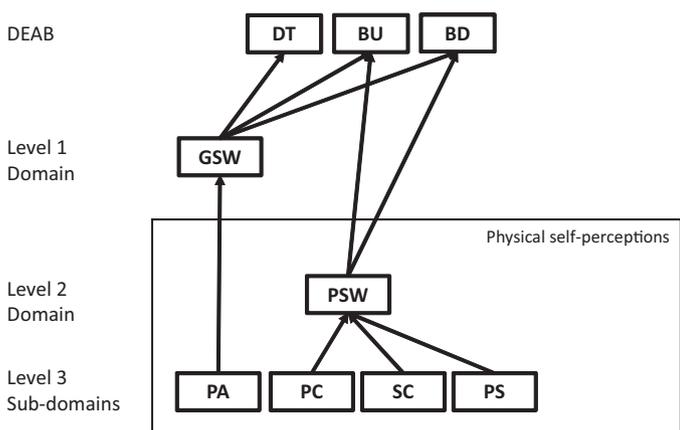
Note. PA = Physical Attractiveness; PC = Physical Condition; PS = Physical Strength; SC = Sport Competence GSW = Global Self-Worth; PSW = Physical Self-Worth; BU = Bulimia; DT = Drive for Thinness; BD = Body Dissatisfaction; Coef. = regression coefficient; SE = standard error of the coefficient; CI = 95% bias-corrected and accelerated confidence interval; R<sup>2</sup> = explained variance.  
 \* p < .05.



**Fig. 2.** Directionality of the direct and indirect relations between global self-worth, physical self-perceptions and disturbed eating attitudes and behaviors in ballet dancers. Note. BD = Body Dissatisfaction; BU = bulimia; DEAB = Disturbed Eating Attitudes and Behaviors; DT = Drive for Thinness; GSW = Global Self-Worth; PA = Physical Attractiveness; PC = Physical Condition; PS = Physical Strength; PSW = Physical Self-Worth; SC = Sport Condition.

correlated to DT and BD; and (e) Physical Condition is significantly and negatively correlated to BD. The results from the indirect effects reveal that (a) the effects of Physical Attractiveness on BU, DT, and BD are significantly mediated by Global Self-Worth; (b) the effects of Physical Condition, Sport Competence and Physical Strength on BU (but not DT) are significantly mediated by Physical Self-Worth; and (c) the effect of Physical Strength on BD is significantly mediated by Physical Self-Worth.

For each significant indirect effect, the relation between physical self-subdomain and Global Self-Worth or Physical Self-Worth is positive, and the relation between Global Self-Worth or Physical Self-Worth and BU, DT, or BD is negative. More precisely, these results show that the negative effects of these specific physical self-perceptions on disturbed eating attitudes and behaviors were fully mediated global self-perceptions, such that increased levels of Physical Attractiveness and (to a lesser extent) Physical Condition, Sport Competence, and Perceived Strength predicted increased levels of Global Self-Worth and Physical Self-Worth, which in turn predicted lower levels of BU, DT, and BD. These results are synthesized in Fig. 3.



**Fig. 3.** Directionality of the direct and indirect relations between global self-worth, physical self-perceptions and disturbed eating attitudes and behaviors in basketball players. Note. BD = Body Dissatisfaction; BU = bulimia; DEAB = Disturbed Eating Attitudes and Behaviors; DT = Drive for Thinness; GSW = Global Self-Worth; PA = Physical Attractiveness; PC = Physical Condition; PS = Physical Strength; PSW = Physical Self-Worth; SC = Sport Condition.

**Non-athletes.** The intercorrelations between the physical self-subdomains themselves and the BU, DT, and BD scores among the non-athletes show that (a) Physical Condition, Physical Attractiveness, and Physical Strength are significantly and positively correlated to Global Self-Worth and Physical Self-Worth; and (b) except for Physical Attractiveness which is significantly and negatively correlated to BD, none of the physical self-subdomains are significantly correlated with BU and DT. None of the indirect effects were significant.

**Discussion**

The purpose of this study was to examine the direct and indirect associations between Global Self-Worth, physical self-perceptions, and disturbed eating attitudes and behaviors among adolescent girl ballet dancers, basketball players, and non-athletes. The first hypothesis postulated that Global Self-Worth and physical self-perceptions would be more importantly related to disturbed eating attitudes and behaviors for athletes competing in aesthetic/leanness sports than for athletes competing in non-aesthetic/leanness sports, or non-athletes. The results supported this hypothesis.

Indeed, the correlation analyses confirmed previous studies, showing that neither Global Self-Worth nor physical self-perceptions (except Physical Attractiveness) were related to disturbed eating attitudes and behaviors for non-athletes (Ferrand et al., 2005, 2009; Filaire et al., 2007; Rouveix et al., 2007), whereas these relations were significant for athletes (Monsma & Malina, 2004). In addition, with few exceptions, Global Self-Worth and physical self-perceptions were also found to be more importantly related to disturbed eating attitudes and behaviors for athletes competing in aesthetic/leanness sports than in non-aesthetic/leanness sports (de Bruin et al., 2007; Ferrand et al., 2005). More precisely, among ballet dancers (a) Global Self-Worth and Physical Self-Worth were significantly and negatively related to their disturbed eating attitudes and behaviors; (b) Physical Attractiveness was negatively and significantly related to Body Dissatisfaction; and (c) perceived Sport Competence was negatively and significantly related to their level of Body Dissatisfaction and to their reliance on compensatory Drive for Thinness strategies.

However, the observed relations between Sport Competence and Drive for Thinness contrast with those from Scoffier et al.'s (2010) study in which a positive relation was observed (i.e., more competence predicted more disturbed eating attitudes and behaviors). This apparent contradiction may be due to the non-elite level of the athletes included in the present study. Indeed, at this level, sport skills are less developed and less stable than at an elite level so that non-elite dancers may be more prone to compensate their lack of mastery by losing weight, taking laxatives, or engaging in other unhealthy habits.

Present findings supported our extended bottom-up hypothesis based on the combination of Sonstroem and Morgan's (1989) bottom-up extension of Fox and Corbin's (1989) model, and etiological theories of eating disorders (e.g., Button et al., 1997; Paxton et al., 2006; van den Berg et al., 2002). Indeed, the results showed that the direction of the associations between physical self-perceptions and disturbed eating attitudes and behaviors goes from the sub-domain level to the domain and global domains, and then to disturbed eating attitudes and behaviors, these relations being fully mediated by Physical Self-Worth and/or Global Self-Worth. More precisely, in athletes, the results suggest that Physical Condition, Sport Competence, Physical Strength, or Physical Attractiveness tend to be integrated into overall self-perceptions (Global Self-Worth and Physical Self-Worth), which in turn negatively relate to levels of Body Dissatisfaction, bulimic behaviors, or Drive for

Thinness strategies—as a way to compensate for negative physical self-perceptions. Consequently, since disturbed eating attitudes and behaviors are more prevalent in leanness/aesthetic sports such as ballet (e.g., Anshel, 2004; Ferrand et al., 2009; Filaire et al., 2007; Neumärker et al., 1998; Rouveix et al., 2007), the present results suggest that interventions encouraging the development of positive physical self-perceptions and their integration in ballet dancers' global self-images may help to reduce these harmful tendencies.

In basketball players, the indirect relations between Physical Strength/Physical Condition/Sport Competence, and Bulimia/Body Dissatisfaction (as mediated by Physical Self-Worth) might appear counter-intuitive since leanness does not apparently play a part in basketball skills. The observed negative indirect relations show that basketball players that are less satisfied with their athletic skills will also be less satisfied with themselves more generally, and thus more likely to experience Body Dissatisfaction and to rely on bulimic strategies. This suggests that when non-elite basketball players are unsatisfied with their physical abilities they might also be tempted to consider extreme means of reducing their level of body fat in order to maximize their muscle/fat ratio. To verify this hypothesis, future research would need to look at the reasons these athletes most commonly invoke to explain their unsatisfactory physical abilities (i.e., elevated level of body fat or lack of training). It would also be interesting to investigate similar relations in a sample of elite basketball players for whom reliance on these more extreme strategies would likely prove counter-productive in the long term.

Some limitations must be taken into account when interpreting these findings. First, the cross-sectional design prevents causal interpretations (Foster, 2010), and also precluded the consideration of inter-individual differences in rates of growth and maturation that may be involved in the development of disturbed eating attitudes and behaviors (Herpertz-Dahlmann, 2002). Second, we focused on a single leanness/aesthetic sport whereas research shows that elite athletes involved in some weight-controlled, but not aesthetic, sports, such as boxing or judo, may also present an elevated prevalence of disturbed eating attitudes and behaviors (Sundgot-Borgen & Torstveit, 2004; Torstveit, Rosenvinge, & Sundgot-Borgen, 2008; Torstveit & Sundgot-Borgen, 2005). As these athletes may indulge in these unhealthy habits on a more irregular basis (i.e., before being weighed, prior to competitions, and during training), future research should be extended to a more diversified array of sports contexts. Third, this study was performed using a small convenience sample exclusively composed of non-elite adolescent girls of dubious generalizability. It was thus unfeasible to use structural equation modeling to evaluate the invariance of the models among the various subgroups considered (due to sample size). More importantly, it is impossible to generalize any of these results to boys, elite athletes, other sports, or to more representative samples of girls.

In conclusion, this study shows that self-concept subdomains are indirectly related to disturbed eating attitudes and behaviors through their relations with Global and Physical Self-Worth in non-elite athlete adolescent girls competing in different types of sports. Particularly noteworthy is the fact that the relations apparently differ according to the type of sport practice. However, this study remains preliminary, and further research is needed before physical self-perceptions can be considered as significant risk factors for disturbed eating attitudes and behaviors among non-elite athletes.

## References

- Anshel, M. H. (2004). Sources of disordered eating patterns between ballet dancers and non-dancers. *Journal of Sport Behavior*, 27, 115–133.
- Baldwin, M., & Courneya, K. (1997). Exercise and self-esteem in breast cancer survivors: An application of the exercise and self-esteem model. *Journal of Sport & Exercise Psychology*, 19, 347–358.
- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality & Social Psychology*, 51, 1173–1182.
- Bonci, C. M., Bonci, L. J., Granger, L. R., Johnson, C. L., Malina, R. M., Milne, L. W., et al. (2008). National athletic trainers' association position statement: Preventing, detecting, and managing disordered eating in athletes. *Journal of Athletic Training*, 43, 80–108.
- Bowker, A. (2006). The relationship between sports participation and self-esteem during early adolescence. *Canadian Journal of Behavioral Science*, 38, 214–229.
- Button, E. J., Loan, P., Davies, J., & Sonuga-Barke, E. J. S. (1997). Self-esteem, eating problems and psychological well-being in a cohort of schoolgirls aged 15–16. A questionnaire and interview study. *International Journal of Eating Disorders*, 21, 39–47.
- Button, E. J., Sonuga-Barke, E. J., Davies, J., & Thompson, M. (1996). A prospective study of self-esteem in the prediction of eating problems in adolescent schoolgirls: Questionnaire findings. *British Journal of Clinical Psychology*, 35, 193–203.
- Criquillon-Doulet, S., Divac, S., Dardennes, R., & Guelfi, J. D. (1995). Le «eating disorder inventory» (EDI). In J. D. Guelfi, V. Gaillac & R. Dardennes (Eds.), *Psychopathologie quantitative* (pp. 249–260). Paris, France: Masson.
- de Bruin, A. P., Bakker, F. C., & Oudejans, R. R. D. (2009). Achievement goal theory and disordered eating: Relationships of disordered eating with goal orientations and motivational climate in female gymnasts and dancers. *Psychology of Sport & Exercise*, 10, 72–79.
- de Bruin, A. P., Oudejans, R. R. D., & Bakker, F. C. (2007). Dieting and body image in aesthetic sports: A comparison of Dutch female gymnasts and non-aesthetic sport participants. *Psychology of Sport & Exercise*, 8, 507–520.
- Ekeland, E., Heian, F., & Hagen, K. B. (2005). Can exercise improve self esteem in children and young people? A systematic review of randomised controlled trials. *British Journal of Sports Medicine*, 39, 792–798.
- Ferrand, C., Champely, S., & Filaire, E. (2009). The role of body-esteem in predicting disordered eating symptoms: A comparison of French aesthetic athletes and non-athletic females. *Psychology of Sport & Exercise*, 10, 373–380.
- Ferrand, C., Magnan, C., & Antonini, P. R. (2005). Body esteem, body mass index and risk for disordered eating in synchronized swimming. *Perceptual & Motor Skills*, 101, 877–884.
- Ferrand, C., Magnan, C., Rouveix, M., & Filaire, E. (2007). Disordered eating, perfectionism and body esteem of elite synchronized swimmers. *European Journal of Sport Science*, 7, 223–230.
- Filaire, E., Rouveix, M., Bouget, M., & Pannafieux, C. (2007). Prévalence des troubles du comportement alimentaire chez le sportif [Prevalence of eating disorders in athletes]. *Science & Sport*, 22, 135–142.
- Foster, E. M. (2010). Causal inference and developmental psychology. *Developmental Psychology*, 46, 1464–1480.
- Fox, K. R. (2000). Self-esteem, self-perceptions and exercise. *International Journal of Sport Psychology*, 31, 228–240.
- Fox, K. R., & Corbin, C. B. (1989). The physical self-perception profile: Development and preliminary validation. *Journal of Sport & Exercise Psychology*, 11, 408–430.
- Fritz, M. S., & MacKinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological Science*, 18, 233–239.
- Garner, D., Olmsted, M., & Polivy, J. (1983). Development and validation of the eating disorder inventory for anorexia nervosa and bulimia. *International Journal of Eating Disorders*, 2, 15–35.
- Hausenblas, H. A., & Fallon, E. A. (2006). Exercise and body image: A meta-analysis. *Psychology & Health*, 21, 33–47.
- Herpertz-Dahlmann, B. (2002). Outcome in adolescent anorexia nervosa. *Acta Neuropsychiatrica*, 14, 90–92.
- Kenny, D. A. (2008). Reflections on mediation. *Organizational Research Methods*, 11, 353–358.
- MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods*, 7, 83–103.
- MacKinnon, D. P., Lockwood, C. M., & Williams, J. (2004). Confidence limits for the indirect effect: Distribution of product and resampling methods. *Multivariate Behavioral Research*, 39, 99–128.
- Maïano, C., Morin, A. J. S., Ninot, G., Monthuy-Blanc, J., Stephan, Y., Florent, J.-F., et al. (2008). A short and very short form of the physical self-inventory for adolescents: Development and factor validity. *Psychology of Sport & Exercise*, 9, 830–847.
- Marsh, H. W., Chanal, J. P., Sarrazin, P. G., & Bois, J. E. (2006). Self-belief does make a difference: A reciprocal effects model of the causal ordering of physical self-concept and gymnastics performance. *Journal of Sport Sciences*, 27, 53–70.
- Marsh, H. W., & Craven, R. G. (2006). Reciprocal effects of self-concept and performance from a multidimensional perspective. Beyond seductive pleasure and unidimensional perspectives. *Perspectives on Psychological Science*, 1, 133–163.
- Marsh, H. W., Gerlach, E., Trautwein, U., Lüdtke, O., & Bretschneider, W.-D. (2007). Longitudinal study of preadolescent sport self-concept and performance: Reciprocal effects and causal ordering. *Child Development*, 78, 1640–1656.
- Marsh, H. W., Papaioannou, A., & Theodorakis, Y. (2006). Causal ordering of physical self-concept and exercise behavior: Reciprocal effects model and the influence of physical education teachers. *Health Psychology*, 25, 316–328.
- Marsh, H. W., & Perry, C. (2005). Does a positive self-concept contribute to winning gold medals in elite swimming? The causal ordering of elite athlete self-concept

- and championship performances. *Journal of Sport & Exercise Psychology*, 27, 71–91.
- Monsma, E., & Malina, V. (2004). Correlates of eating disorders risk among female figure skaters: A profile of adolescent competitors. *Psychology of Sport & Exercise*, 5, 447–460.
- Monthuy-Blanc, J., Morin, A. J. S., Pauzé, R., & Ninot, G. (2012). Direction of the relations between global self-esteem and physical self components in anorexic outpatient girls: An in-depth idiographic analysis. In N. Gotsirize-Columbus (Ed.), *Advances in psychology research*. New York, NY: Nova Science.
- Morin, A. J. S., & Maïano, C. (2011). Cross-validation of the short form of the physical self-inventory (PSI-S) using exploratory structural equation modeling (ESEM). *Psychology of Sport & Exercise*, 12, 540–554.
- Morin, A. J. S., Maïano, C., Marsh, H. W., Janosz, M., & Nagengast, B. (2011). The longitudinal interplay of adolescents' global self-esteem and perceived physical appearance: A conditional autoregressive latent trajectory analysis. *Multivariate Behavioral Research*, 46, 157–201.
- Neumärker, K. J., Bettle, N., Bettle, O., Dudeck, U., & Neumärker, U. (1998). The eating attitude test: Comparative analysis of female and male students at the public ballet school of Berlin. *European Child & Adolescent Psychiatry*, 7, 19–23.
- Paxton, S. J., Eisenberg, M. E., & Neumark-Stzainer, D. (2006). Prospective predictors of body dissatisfaction in adolescent girls and boys: A five-year longitudinal study. *Developmental Psychology*, 42, 888–899.
- Petrie, T. A., & Greenleaf, C. A. (2007). Eating disorders in sport: From theory to research to intervention. In G. Tenenbaum & R. Eklund (Eds.), *Handbook of sport psychology* (pp. 352–378). Hoboken, NJ: Wiley.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing indirect effects in multiple mediator models. *Behavior Research Methods*, 40, 879–891.
- Rosendahl, J., Bormann, B., Aschenbrenner, K., & Strauss, B. (2008). Dieting and disordered eating in German high school athletes and non-athletes. *Scandinavian Journal of Medicine & Science in Sports*, 19, 731–739.
- Rouveix, M., Bouget, M., Pannafieux, C., Champely, S., & Filaire, E. (2007). Eating attitudes, body esteem, perfectionism and anxiety of judo athletes and nonathletes. *International Journal of Sports Medicine*, 28, 340–345.
- Sangenis, P., Drinkwater, B. L., Loucks, A., Sherman, R. T., Sundgot-Borgen, J., & Thompson, R. A. (2005). *International olympic committee (IOC) consensus statement on the female athlete triad*. [http://multimedia.olympic.org/pdf/en\\_report\\_917.pdf](http://multimedia.olympic.org/pdf/en_report_917.pdf)
- Scalas, F., & Marsh, H. W. (2008). A stronger latent-variable methodology to actual–ideal discrepancy. *European Journal of Personality*, 22, 629–654.
- Scoffier, S., Maïano, C., & d'Arripe-Longueville, F. (2010). The effects of social relationships and acceptance on disturbed eating attitudes in elite adolescent female athletes: The mediating role of physical self-perceptions. *International Journal of Eating Disorders*, 43, 65–71.
- Sonstroem, R., Harlow, L. L., & Josephs, L. (1994). Exercise and self-esteem: Validity of model expansion and exercise associations. *Journal of Sport & Exercise Psychology*, 16, 29–42.
- Sonstroem, R., & Morgan, W. P. (1989). Exercise and self-esteem: Rationale and model. *Medicine & Science in Sports & Exercise*, 21, 329–337.
- Sonstroem, R., Speliotis, E., & Fava, J. (1992). Perceived physical competence in adults: An examination of the physical self-perception profile. *Journal of Sport & Exercise Psychology*, 14, 207–221.
- Sundgot-Borgen, J., & Torstveit, M. K. (2004). Prevalence of eating disorders in elite athletes is higher than in the general population. *Clinical Journal of Sport Medicine*, 14, 25–32.
- Thøgersen, C., Fox, K. R., & Ntoumanis, N. (2002). Testing the mediating role of physical acceptance in the relationship between physical activity and self-esteem: An empirical study with Danish public servants. *European Journal of Sport Science*, 2, 1–10.
- Torstveit, M. K., Rosenvinge, J. H., & Sundgot-Borgen, 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., & Sundgot-Borgen, J. (2005). The female athlete triad: Are elite athletes at increased risk? *Medicine & Science in Sports & Exercise*, 37, 184–193.
- van den Berg, P., Thompson, J. K., Obremski-Brandon, K., & Coovert, M. (2002). The tripartite influence model of body image and eating disturbance: A covariance structure modeling investigation testing the mediational role of appearance comparison. *Journal of Psychosomatic Research*, 53, 1007–1020.