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Social Physique Anxiety and Disturbed Eating Attitudes and Behaviors in Adolescents:
Moderating Effects of Sport, Sport-Related Characteristics and Gender

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Abstract

Purpose. The involvement of adolescents presenting high levels of social physique anxiety (SPA) in sport practice has been hypothesized as potentially problematic in terms of being associated with disturbed eating attitudes and behaviors (DEAB). Indeed, sport practice itself has been reported to be associated with higher levels of SPA and DEAB, and sport settings may sometimes involve the promotion unhealthy life habits. Nevertheless, current studies are few and present several limitations. The objective of the present study is to examine these relations among adolescents involved or not in various types (leanness and individual) and contexts (organized and competitive) of sport practice.

Method. The sample included 766 adolescents (337 boys and 429 girls), aged between 11 and 18 years, involved ($n= 335$) or not ($n= 431$) in sport practice. SPA and DEAB were assessed using French adaptations of the SPA Scale and the Eating Attitudes Test-26.

Results. The results reveal a significant and positive association between SPA and the DEAB scales. Furthermore, they show a positive relationship between SPA and (a) vomiting-purging behaviors in adolescents involved in individual sports; and (b) generic DEAB (i.e., a subscales covering fear of getting fat, food preoccupation, and eating-related guilt), particularly in adolescents involved in individual sports.

Conclusions. The relationship between SPA and DEAB do not differ according to adolescents' involvement in sport practice, or according to their involvement in organized, competitive or leanness sport practice more specifically. However, higher levels of SPA and DEAB were observed for adolescents involved in individual sports.

Keywords. Disturbed eating attitudes and behaviors, social physique anxiety, gender, sport practice, moderation.

Self-presentation [1,2] refers to the processes through which people watch and control the way they are perceived and evaluated by others, for the purpose of conforming to the generally positive impression they wish to project [3, 4]. The manner in which they try to control or conform to the impressions they wish to project is explained in Leary and Kowalski's [5] impression management model, which comprises two components [5-7]: impression motivation, and impression construction. The first component concerns the motives that lead a person to be preoccupied with the way he/she is perceived and evaluated by others and to manage the impression he/she projects [5-7]. The second component consists of determining the impression the person wishes to project and the means used to do so [5-7].

During adolescence many young people may feel some insecurity about their newly emerging adult-like figures and are thus particularly sensitive to the way others perceive their physical appearance [8]. Therefore, when they doubt their ability to present an appearance that corresponds to the western sociocultural ideals standards (i.e., thin for girls, muscular for boys) [9, 10] or come to doubt that their physique could be positively perceived by others [11], they may develop social physique anxiety (SPA) [12, 13]. This concept refers to "a subtype of social anxiety that occurs as a result of the prospect or presence of interpersonal evaluation involving one's physique. By physique, we mean one's body form and structure, specifically body fat, muscle tone, and general body proportions" [12, p. 96]. The SPA concept and the factor structure of SPA measures have been found to be cross-culturally valid, reliable and invariant across gender [e.g., 11, 14, 16, 17]. Nevertheless, although significantly higher levels of SPA are more commonly observed among girls than boys [e.g., 11, 14-16, 18-21], boys are still not exempt from the experience of potentially serious concerns related to their physical appearance [20], especially when defined broadly such as the definition used in the current study (e.g., incorporating muscularity).

Adolescents presenting high levels of SPA have been reported to be more subject than others to physical self-presentation pressure and more motivated to cope with this problem [12, 20-23] using either avoidance mechanisms (e.g., wearing loosely fitting clothes to in order to hide their body shape), or remedial behaviors aimed at altering their physique through either healthy or unhealthy behaviors [20].

These coping strategies may be either behavioral (aggressive activities, behavioral avoidance, dieting, short-term appearance management, spitting-vomiting, etc.) or cognitive (acceptance, cognitive problem solving, wishful thinking, social support, etc.) [20, 21]. Disturbed eating attitudes and behaviors (DEAB) have recently come under scrutiny as one of the possible remedial and unhealthy strategies that may be used by some adolescents in order to better cope with SPA. DEAB refer to abnormal (a) eating-related beliefs, thoughts, feelings [24] (fear of getting fat, drive for thinness, etc.); and (b) eating behaviors such as restrictive eating or fasting, overeating or binge-eating, skipping meals, or more extreme behaviors such as using medications (dieting pills, diuretics, laxative) or purging (vomiting) [25]. These DEAB are generally driven by a desire to be thin and by the belief that they represent effective means to conform to their desired physical image and thus diminish their levels of SPA [14, 26]. DEAB are considered as potential precursors or precipitating factors in the development of eating disorders in adolescents [27-29].

The relationship between SPA and DEAB has been recently examined among mixed samples (boys and girls) of adolescents and young adults. Although current studies are still few, they highlighted that high levels of SPA are significantly associated with high levels of DEAB among both boys and girls [11, 14, 30, 31], but that the strength of the positive relationship between SPA and DEAB tend to be significantly higher for girls than for boys [14]. These gender-based differences on the strength of the positive relationship between SPA and DEAB may be explained by the fact that the physical self-presentation concerns experienced by boys tend to be more commonly driven by a desire to be more muscular rather than a desire to be thin [14, 32].

Sport practice represents one of the possible ways through which adolescents may exert some control on their physical shape [33]. Although sport practice may represent a healthier way to do so than some of the alternative strategies listed above, studies have showed that involvement in sport practice may in itself be related to higher levels of SPA [7, 34] and DEAB [33, 35-40] in adolescents. Furthermore, some research even suggest that exercising with the intention of controlling weight and shape, in addition to generating feelings of guilt, may be directly related to increased levels of DEAB [e.g., 41, 42]. This suggest that involvement in sport practice may be particularly problematic for adolescents already

presenting high levels of SPA or DEAB. Indeed, by heightening adolescents' levels of self-presentational concerns and DEAB, sport involvement may exacerbate the relations, or even change the direction (positive or negative) of the relations, between SPA and DEAB. In practice, this possibility suggests that the positive relation between SPA and DEAB may be either specific to adolescents involved in sport practice (or certain types or contexts of sport practice), or at least stronger among adolescents involved in sport practice (or certain types or contexts of sport practice), than in other adolescents.

This potentially unhealthy effect sport practice on the relation between SPA and DEAB is worrying and clearly deserving of further investigations. In particular, there is a need to look more specifically at the various forms of sport practices, and at the variety of contexts (physical and social) of sport practice, in which the adolescents may be involved. By their nature some types (e.g., esthetics, leanness, or individual sports) or contexts (e.g., club, or competitive) of sport practice may increase adolescents' felt pressure to be thin or their awareness that their physique (e.g., weight, figure, or appearance) is evaluated by others (e.g., more salient or revealed, or directly under examination) [3, 33, 43]. In turn, these adolescents may experience heightened levels of physical self-presentation concerns and become even more motivated to control their physique [3, 33, 43].

Although existing studies on the relationship between SPA and DEAB among adolescents and young adults involved in sport practice are still few, they all highlight a positive relationship between SPA and DEAB (e.g., drive for thinness, dieting, body dissatisfaction, bulimia or overall score) [44-49]. However, these results must be interpreted with caution. Indeed, only a minority of these studies includes a group of participants not involved in sport practice [45, 48], which precluded direct tests of the potential moderating role of involvement in sport practice. It is thus currently impossible to determine whether the direction and/or the strength of the relationship between SPA and DEAB may be different for adolescents involved or not in sport practice.

Second, only two studies examined the moderating effect of the type of sports [47, 48] on the relationship between SPA and DEAB. Additionally, these analyses were only performed with samples of adolescents involved in sport practice and their results are contradictory. Indeed, Haase and Prapavessis

[48] show an absence of moderation for physique-salient sports (i.e., sports that place the physique on display, such as aerobics, diving, etc.) versus other types of sports, while Haase [47] indicates a significant moderating effect of individual (vs. team) sports showing that the relationship between SPA and DEAB tends to be more pronounced for adolescents involved in individual sports. Furthermore, the total number of sports in each of the categories considered in these studies remains very limited and none of them examined the moderating effect of leanness sports (i.e., sports emphasizing lean body shapes or controlling body weight, such as figure skating, gymnastics, etc.). This is surprising, since some studies emphasize the fact that leanness sports are the most strongly related to DEAB [e.g., 50, 51]. Consequently, the issue of a potential moderating effect of the type of sport practice on the relationship between SPA and DEAB remains pending.

Third, most studies (except for [44, 45]) were conducted almost exclusively with adolescents practicing competitive sport practices at an elite level in an organized context (i.e., club or school). This is unfortunate in terms of generalizability, since the majority of adolescents tend to practice sports in a non-organized and non-competitive context [52, 53]. Thus, we do not know whether the context (organized vs. free, competitive vs. non-competitive) might be a moderator of the relationship between SPA and DEAB.

Fourth, these studies focused almost exclusively on adolescent girls involved in sport practice. The only study [46] that examined whether this relationship differed by gender, showed a significant effect in girls, but not in boys. However, the results of that study should be interpreted with caution because it did not include a sample of adolescents not involved in sport practice. Consequently, despite the fact that boys' physical self-presentation concerns tend to be more driven by muscularity (versus thinness), it is still unknown whether the positive relationship between SPA and DEAB among adolescents involved or not in sport practice is gender-based or not.

Fifth, to our knowledge, none of the previous studies controlled for the effect of body mass index (BMI) and age in the relationship between both SPA and DEAB. This is surprising, since research shows that BMI [e.g., 54, 55] and age [e.g., 18, 29] are significantly related to SPA and DEAB during adolescence. It is thus probable that in these studies, the significance of the relationship between SPA and

DEAB was influenced by the adolescents' BMI and age so that the relation between SPA and DEAB might be entirely due to both of these variables, or at least substantially reduced when they are properly controlled.

This study has three objectives. First, this study attempts to replicate the previously reported significant positive relationships between SPA [11, 14, 30, 31] or involvement sport practice [e.g., 33, 35-40], and DEAB dimensions (i.e., generic DEAB, eating-related control, and vomiting-purging behaviors) in adolescents. This objective will be investigated while controlling for the effects of age and BMI, both of which have been found to significantly predict SPA and DEAB [18, 29, 54, 55].

Second, this study aims to investigate whether the direction (positive or negative) and/or the strength of the relationships between SPA and DEAB differs according to involvement or not in sport practice, and as a function of the type and context of the sport practice. This objective is particularly important for behavioral medicine given that body image concerns and unhealthy eating attitudes and behaviors are known to occur frequently during adolescence [27-29], and that sport practice is (a) "one of the most popular leisure-time activities among young people" [56, p. 269], and (b) often recommended as an health-promoting setting for adolescents in several countries [56-59]. From a theoretical point of view, the possibility that sport practice, or some types or contexts of sport practice, may possibly be related to adverse outcomes in terms of promoting unhealthy DEAB for adolescents presenting high levels of SPA represent an important information to take into account in the etiology of DEAB. From a practical perspective, it is even more important for practitioners who may recommend sport practice as a healthy settings to support positive adolescent development to be aware that, in some cases, this setting may also carry risk for adolescents presenting high levels of body image concerns or an elevated risk for DEAB. At least, if these effects depend on the type, or context, of sport practice, then interventions can be tailored to the specific characteristics of the target adolescent.

Third, this study aims to verify previous reports [e.g., 14, 60-63] that the relationship between SPA or involvement in sport practice, and DEAB may differ according to the adolescents' gender. According to these previous reports (a) girls involved in sport practice tend to present significantly higher

levels of DEAB than girls not involved in sport practice [61, 62], whereas boys involved in sport practice tend to present significantly lower levels of DEAB than boys not involved in sport practice [60, 63]; and (b) the positive relationship between SPA and DEAB appear to be higher in girls than in boys [14].

More specifically, this study will test the hypotheses (H) that: (a) SPA (H1) and involvement in sport practice (and some of its characteristics) (H2) are significantly and positively related to DEAB, (b) the relationships between SPA and DEAB significantly differ according to involvement or not in sport practice (H3), and according to some characteristics of the sport practices (H4); and (c) the relationship between DEAB and sport practice (i.e., involvement and some of its characteristics) (H5), or SPA (H6), significantly differs according to the participants' gender.

Method

Participants and Procedures

A total of 809 adolescents studying in 13 educational institutions in Southern France were targeted to be part of this study between September 2007 and June 2008. However, 43 adolescents were excluded due to their age (< 11 years or > 18 years; $n = 26$), failure to return completed questionnaires ($n = 13$), or the return of questionnaires that appeared not to have been completed seriously ($n = 4$; i.e., aberrant information were mentioned across sections of the questionnaires; participants answered by forming diagonals in the answers choices irrespective of items labels; answers sections used to form drawings, etc.). The final sample thus includes 766 adolescents ($M_{age} = 14.61$; $SD_{age} = 2.13$; $M_{body-mass\ index} = 19.94$; $SD_{body-mass\ index} = 3.19$), aged between 11 and 18 years. Of those, 337 are boys (coded 1), 429 are girls (coded 0). Furthermore, 524 are of European origin, 198 of African origin and 44 of other origins (e.g., Asian, American, etc.). The sample was divided into two subgroups of adolescents: not involved ($n = 431$; coded 0) and involved ($n = 335$; coded 1) in sport practice.

The adolescents not-involved in sport practice were only involved in physical education classes. In addition to physical education classes, some adolescents were practicing their main sport practice (for more than one year for 69% of them) in or outside school between one to eight times a week ($M = 2.36$ times/week; $SD = 1.21$), for a total weekly duration varying from 25 minutes to 12 hours ($M = 3.33$

hours/week; $SD = 1.94$). These adolescents practiced a total of 46 different sports. For the purposes of this study, all of these sports were first categorized in two ways according to Sungot-Borden [64], and Torstveit and Sungot-Borden's [65] classification: leanness ($n = 134$, coded 1; e.g., dancing, figure skating, gymnastics, swimming, cycling, boxing, karate) or non-leanness sports (coded 0; e.g., badminton, basketball, archery, horse riding, sailing). Second, these sports were categorized in individual ($n = 203$, coded 1) or team sports (coded 0) following Haase's [47] classification. Third, the adolescents involved in sport practice were also classified according to their context of sport practice: (a) an organized context ($n = 249$, coded 1; i.e., within their sport school association or club) or not (coded 0; i.e., outside the sport school association or a club); and (b) a competitive context ($n = 149$, coded 1; i.e., adolescents who practiced their sport at a competitive level) or not (coded 0). All of these categorizations are based on the responses obtained at the sport practice questionnaire described below.

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

Measures

Sport Practice. The participants filled out a questionnaire in which they were to be asked report (a) their age, gender, height, weight and ethnic origin; (b) whether they practice a sport with the school sport association, outside the school or not [e.g., *“Do you practice a sport with the school sport association?”* *“Do you practice a sport outside of school (i.e., outside of your physical education classes and of the school sport association?)”*]; (c) their main sport (i.e., the most important in time and frequency) that they practice (e.g., *“What is the main sport that you practice with the school sport association?”*, *“What is the main sport that you practice outside of the school?”*); (d) the weekly times and frequency of their main sport practice (e.g., *“How many hours a week/How many times a week do you practice your main sport with the school sport association?”*, *“How many hours a week/How many times a week do you practice your main sport outside of the school?”*); (e) whether they practice their main sport outside the school in a

sports club or not (e.g. “*Outside of the school context, do you practice your main sport in a sport club?*”); and (f) whether they compete or not in their main sport (e.g., “*In your school sport association, do you participate in competitions in your main sport?*”, “*In your club, do you participate in competitions in your main sport?*”) as well as the competition level (e.g., leisure, local, regional or national).

Body Mass Index. The BMI was calculated as $BMI = \text{Weight}/\text{Height}^2$. Weight and height information was self-reported by the adolescents.

Disturbed Eating Attitudes and Behaviors. DEAB were assessed using the French adaptation [66] of the Eating Attitudes Test-26, which comprises 18 items (EAT-18) and assesses six dimensions: fear of getting fat (e.g., “*I am preoccupied with a desire to be thinner*”), eating-related guilt (e.g., “*I feel extremely guilty after eating*”), food preoccupation (e.g., “*I feel that food controls my life*”), eating-related control (e.g., “*I aware of the calorie content of foods I eat*”), social pressure to gain weight (e.g., “*I feel that others would prefer if I ate more*”), and vomiting-purging behavior (e.g., “*I vomit after I have eaten*”). Participants responded to the statements according to a six-level (6 = *always*, 1 = *never*) Likert-type scale. The psychometric properties of this questionnaire were tested with 2178 adolescents, and the analyses confirm its factorial validity [i.e., factorial structure; internal consistency ($\alpha = 0.69-0.84$ between the scales/studies); invariance (by age, gender, ethnic origin and weight category of the adolescents)] and convergent validity (global self-esteem, physical appearance, SPA and fear of negative appearance evaluation). In the validation study of the French EAT, Maïano et al. [66] note that “half of the EAT-18 subscales (i.e., Fear of Getting Fat, Food Preoccupation, Eating-Related Guilt) are directly related to core symptoms of both anorexia nervosa and bulimia nervosa. Similarly, other subscales of the EAT-18 may be used to screen for symptoms specific to bulimia (i.e., Vomiting-Purging Behavior) and anorexia (i.e., Eating-Related Control) nervosa, and thus can likely be used to screen for these specific eating disorders.” (p. 12). In order to avoid adding unnecessary complexity to the study while also keeping a reasonable coverage of the range of DEAB characteristics covered in the EAT, three scales were retained and used in the present study: (1) one measuring generic DEAB characteristics and combining into a global score the subscales of fear of getting fat, the food preoccupation and the eating-related guilt, which were also found

to be highly correlated in Maïano et al.'s [66] study; (2) one tapping into characteristics more closely associated with anorexia nervosa, based on the eating-related control subscale, and (3) one tapping into characteristics more closely associated with bulimia nervosa, based on the vomiting-purging behavior subscale. In this study, the internal consistencies of these three dimensions are acceptable (see Table 1).

Social Physique Anxiety. SPA was assessed using the French version of the Social Physique Anxiety Scale [11, 12], in which participants assess seven statements (e.g., “*In the presence of others, I feel apprehensive about my physique/figure*”) according to a five-level (1 = *not at all*, 5 = *extremely*) Likert-type scale. The psychometric properties of this questionnaire were tested with 1573 adolescents, and the analyses confirm its factorial validity [i.e., factorial structure; internal consistency ($\alpha = .81-.87$ between the studies and participant subgroups); temporal stability ($r = .78$); invariance (by age and gender)], convergent validity (social anxiety, self-esteem, fear of negative evaluation and body image disturbance) and discriminant validity (non-clinical vs. anorexic). In this study, the internal consistency of the scales is acceptable (see Table 1).

Results

Preliminary Analyses

The relationships between the different variables were examined using Pearson correlations. The results, which are presented in Table 1, show that (a) age is significantly and negatively correlated with gender, Eating-Related Control, organized sport practice, and competitive sport practice; (b) gender is significantly and negatively correlated with leanness sport practice, SPA, generic DEAB and eating-related control, but also significantly and positively correlated with sport practice, organized sport practice, and competitive sport practice; (c) BMI is significantly and positively correlated with age, SPA and generic DEAB; (d) involvement in sport practice is significantly and positively correlated with sport-related characteristics (organized, leanness, competitive and individual); (e) involvement in organized sport practice is significantly and positively correlated with involvement in leanness, competitive and individual sports; (f) involvement in leanness sport practice is significantly and positively correlated with involvement competitive and individual sports, as well as with generic DEAB; (g) involvement in

competitive sport practice is significantly and positively correlated with individual sports; (h) involvement in individual sports is significantly and positively correlated with eating-related control; (i) SPA is significantly and positively correlated with all DEAB scales; and (j) all DEAB scales are correlated with one another. For even more specificity, we also report gender-differentiated correlations in Table 1. Results revealed that the relationship between the variables among gender subsamples were generally similar, and of same nature and strength, than those reported in the total sample (see Table 1).

Association between Predictors and Disturbed Eating Attitudes and Behaviors

A series of multiple regressions was used to study the relationships between the DEAB scales and: (a) the participants' age, BMI, gender, SPA, involvement in sport practice, and sport-related characteristics (organized, leanness, competitive and individual); and (b) the interaction between SPA, gender and sport practice (i.e., involvement in sport practice and in organized, leanness, competitive and individual sports). The analyses were conducted in four successive steps: (1) age and BMI (control variables); (2) SPA, gender and involvement in sport practice; (3) sport-related characteristics; and (4) two-way interactions: SPA X gender; SPA X sport characteristics; gender X sport characteristics.

The results from the multiple regression analyses are presented in Table 2. The results from the first step of the analyses reveal a significant and negative association ($p < .05$) between age and the generic DEAB and eating-related control scales. However, the relationship between age and the generic DEAB scale becomes non-significant when the remaining predictors are introduced in the model. These results also show a significant ($p < .05$; see Table 2) and positive association between the BMI and the generic DEAB and eating-related control scales. However, when the remaining predictors are introduced in the model, the association between BMI and eating-related control becomes non-significant. Thus, in the main model including most predictors, age presents a significant negative association with eating-related control showing that levels of eating-related control seem to decrease with age, while BMI presents a significant positive association with generic DEAB.

The results from the second step of the analyses reveal a significant and positive association ($p < .05$; see Table 2) between SPA and all of the DEAB scales. The results also show that gender is

significantly and negatively ($p < .05$; see Table 2) associated with generic DEAB and eating-related control, revealing higher levels among girls. Finally, the results from the third step of the analyses revealed no significant association ($p > .05$; see Table 2) between involvement in sport practice and sport-related characteristics (organized, leanness, competitive and individual sports) and the DEAB scales.

Moderating Effects of involvement in Sport Practice, Sport-Related Characteristics and Gender

The results from the fourth step of the analyses first reveal significant two-way interactions^a between gender and SPA ($p < .05$; see Table 2) in the prediction of the eating-related control scale. Investigation of the simple slopes of the predictor at different levels of the moderator (see Figure S1 in the online supplementary materials) shows a positive relationship, for boys and girls alike, between levels of SPA and eating-related control although this relationship is more pronounced for boys [boys ($b = .22$; SE = .05; $p < .001$); girls ($b = .09$; SE = .04; $p = .04$)]. Thus, higher levels of SPA tend to be associated with higher levels of eating-related control, particularly among boys.

The results also show significant two-way interactions between gender and involvement in sport practice ($p < .05$) in the prediction of generic DEAB. However, investigation of the simple slopes of the predictor at different levels of moderator (see Figure S2 in the online supplementary materials) shows a significant and negative relationship between involvement in sport practice and generic DEAB in boys ($b = -2.71$; SE = 1.32; $p = .04$), but not for girls ($b = 2.46$; SE = 1.63; $p = .13$). Thus, global sport practice tend to be associated with lower levels of generic DEAB among boys, but not girls.

When we looked at the specific characteristics of the sport context, some of them present significant two-way interactions with SPA levels in the prediction of DEAB. First, SPA significantly interacts with the practice of individual sports ($p < .05$; see Table 2) in the prediction of vomiting-purging behaviors and generic DEAB. Investigation of the simple slopes of the predictor at different levels of the moderator (see Figure S3a in the online supplementary materials) shows a significant and positive relationship between SPA and vomiting-purging behaviors ($b = .13$; SE = .05; $p = .005$) in adolescents who practice an individual sport, but not for adolescents involved in team sports ($b = .02$; SE = .01; $p = .10$). Additionally, the positive relationship between SPA levels and generic DEAB (see Figure S3b in the

online supplementary materials) appears more pronounced among adolescents involved in individual sports ($b = 1.12$; $SE = .22$; $p < .001$) than among the others ($b = .69$; $SE = .06$; $p < .001$).

Discussion

This study, based in part on Leary and Kowalski's [5] impression management model, aimed to verify the hypotheses that (a) SPA (H1) and involvement in sport practice (H2) are significantly and positively related to DEAB; (b) the relationships between SPA and DEAB significantly differ according to involvement or not in sport practice (H3), and to the specific type and context of sport practice (H4); and (c) that the relationships between DEAB and sport practice (H5), or SPA (H6), will significantly differ according to gender. The obtained results confirm the first hypothesis (H1) and replicate previous research findings [e.g., 11, 14, 30, 31] by demonstrating a significant and positive relationship between SPA and DEAB (i.e., generic DEAB, vomiting-purging behaviors and eating-related control). More specifically, as pointed out Martin-Ginis and Leary [23], these results are consistent with the idea that adolescents presenting higher levels of self-presentation pressure also tend to present higher levels of DEAB, possibly in an attempt to achieve a thinner physical self-image. However, the results also reveal a lack of relation between involvement in sport practice (irrespective of the type and context of this practice) and DEAB levels in adolescents, and even a lack of significant interaction between SPA and involvement in sport practice in the prediction of DEAB among the total sample. This absence of interaction clearly shows that involvement in sport practice is not in itself problematic for adolescents in general, or adolescents presenting a high level of SPA in particular, as the relationship between SPA and DEAB remains substantial and significant throughout the analyses, and not moderated by involvement in sport practice.

In fact, sport practice itself, as well as involvement into leanness sports or practicing sports in organized or competitive contexts do not seem to present any relation with DEAB. These results contradict previous studies [e.g., 35-40, 44-51] and infirm the second (H2) and third (H3) hypotheses. These contradictory findings may be explained by the differences in the characteristics of the samples studied in terms of status (i.e., adolescents involved or not in sport practice), gender and variety of sport practice contexts considered. Indeed, most of the previous studies examining the moderating role of

involvement in sport practice in the relationship between SPA and DEAB were conducted exclusively with adolescents involved in sport practice, while in the current study relied on a mixed sample. Additionally, the samples in previous studies were composed almost exclusively of female adolescents who practice a competitive sport at the elite level, while the sample in the present study is again mixed in terms of gender and contexts of sport practice that are considered. For instance, less than half (44%) of the adolescents from the present sample practice a sport at a competitive level, and they do so almost exclusively at the non-elite level (93%). Thus, previous studies [e.g., 61, 62] show that girls involved in sport practice have significantly higher levels of DEAB than girls not involved in sport practice. However, most girls included in these studies are involved in a competitive sport at the elite level, a specific segment of the population that is recognized to be particularly at risk of DEAB [36, 38, 39], yet forms only a negligible proportion of the present sample. The scientific literature shows this subgroup to be more subject than any others to high levels of SPA and DEAB because of the great pressure they are under to conform to highly specific physical shapes [36, 38, 39]. In contrast, the current results show that the relationship between less intensive levels of involvement in sport practice and DEAB tends to be non-significant among girls. However, for boys, as already shown in the literature [60, 63], involvement in sport practice tended to be associated with lower levels of DEAB, suggesting a potentially protective relationship. Our results thus suggest that sport practice may be beneficent for boys, whereas for girls no such effect is apparent. These findings thus support the fifth hypothesis (H5) in confirming that gender plays a moderating role in these relationships, while only partially confirming the pattern of relations that was expected to be observed in gender-specific subgroups.

However, the results identified one sport-related characteristic that tended to be associated with a more pronounced negative relationship between SPA and DEAB. More precisely, adolescents with high SPA levels who practice an individual sport tended to present higher levels of vomiting-purging behaviors and generic DEAB than other adolescents. This result partially confirm the fourth hypothesis (H4) and is consistent with Haase's [47] results in showing that individual sports tends to be associated with higher levels of DEAB in adolescents with high levels of SPA. This result could be explained,

according to Haase [47], by the fact that many individual sports focus on the physique (i.e., esthetics, body-revealing uniforms, etc.) and thus expose adolescents with high SPA to even greater social physique evaluation, comparison and pressure to be thin(ner). In this instance, individual sports could potentially lead these adolescents to develop higher levels of DEAB. Conversely, team sports appear more likely to play a protective role, by being associated with a non-significant relation between high levels of SPA and DEAB. Haase [47] explains this result by the fact that team sports focus less on comparing and evaluating the physique more on group processes.

Further reinforcing the importance of considering gender in the evaluations of these relationships, the results are consistent with previous studies [67, 68] and clearly show higher levels of DEAB (i.e., generic DEAB and eating-related control) for girls than for boys. Additional results also reveal that higher levels of SPA tend to be associated with high levels of eating-related control for boys and girls, but that this relation was more pronounced for boys. This result suggests thus that boys with high levels of physical self-presentation concerns, which are usually less frequent than in girls, tend to exhibit higher levels (in magnitude) of food control strategies. This finding is in contradiction with previous studies [14, 30] and infirm the sixth hypothesis (H6). What is known is that leanness and thinness concerns, which is at the core of the SPA and DEAB measures considered in the present study, tends to be less frequent among boys than among girls (27-29). However, our results show that the association between these concerns and eating-related control strategies tends to be more pronounced for boys. A possible reason for this result could be explained by a gender-based difference in the type of abnormal eating-related attitudes and behaviors use by adolescents to cope with their high levels of DEAB. Indeed, the type of DEAB assessed in this study couldn't be considered as exhaustive, and more extreme abnormal eating-related behaviors, such as overeating or binge eating or using medications (dieting pills, diuretics or laxative) were not examined in this study. These results shows that boys showing higher levels of self-presentation concerns may more willingly favor controlling their food input – in conjunction with sport practice – than relying on more extreme abnormal eating-related behaviors. This is the unhealthy strategy that they used in order to face with their physical self-presentation concerns. It is thus probable that girls

tend to rather use more extreme abnormal eating-related behaviors in order to deal with their high level of SPA. Consequently, the gender differences in the relationship between SPA and DEAB should be replicated using additional instruments measuring more extreme abnormal eating-related behaviors and the reasons underlying the use of these DEAB.

However, this study also presents limitations. First, this study relied on a cross-sectional design, precluding examination of the directionality of the associations between SPA and DEAB. Consequently, it is unknown whether (a) higher levels of DEAB predict later increases in SPA levels, (b) higher levels of SPA predicted later increases in DEAB levels, or (c) both. Only a longitudinal design will provide clear answers to these questions. Second, this study specifically focused on the use of DEAB as a coping strategy for physical self-presentational concerns related to thinness or leanness. Yet, despite the fact that the observed relationships are equally relevant for boys and girls, and may even be more pronounced for boys in some cases, research shows that for boys self-presentational concerns tend to be driven by muscularity more often than by thinness or leanness [e.g., 14, 32]. The fact that this study fails to consider concerns specifically related to muscularity and their possible relation with DEAB thus represents an important limitation of this study, and an area that should be more thoroughly investigated by future research. Additionally, although the sport practice categorization used in the present study took into account leanness sports characterized by an emphasis on leanness/thinness, no distinction was made for sports where the main emphasis is on muscularity, weight gain, or even drastic weight control (e.g., body building, football, power lifting) [69, 70]. Arguably, these sports may interact differently with the reported relationships than the various sport classifications that were considered in this study. This may be especially true for boys, who tend to be more concerned by muscularity than leanness/thinness. Clearly, the consideration of the potential impact of muscularity-oriented and weight-controlled sports in the relationships between SPA, gender, and DEAB should be the object of future studies. Third, less than half of the adolescents from this study were involved in competitive sports and most did so at a non-elite level. Therefore, we cannot clearly identify the moderating role of the type of competition (i.e., elite and non-elite) on the relationship between SPA and DEAB. This hypothesis should be examined in the near future

with a larger sample of adolescents who practice non-competitive and competitive sports at the elite or non-elite level. Finally, this study neglected to examine more pathogenic behaviors (i.e., dieting, vomiting, fasting, use of laxative and/or diuretics, enemas, appetite suppressants, etc.) that adolescents could use to control their physique. Therefore, we do not know whether SPA is associated with the pathogenic weight-control behaviors that adolescents engage in or whether sport practice (and some of its characteristics) is a moderator of this relationship. These questions merit specific examination in future research.

Notwithstanding the aforementioned limitations, this study also has several implications for researchers and practitioners in behavioral medicine. From a theoretical perspective, this study not only confirms that high levels of SPA are significantly associated with higher levels of DEAB among adolescent boys and girls, but also highlights that in some occasions gender-based differences may also be in disfavor of boys (e.g., with the association between SPA and eating-related control being more pronounced among boys than girls). Nevertheless, as above mentioned, the empirical data on this issue is limited and relatively recent, and to our knowledge no information is currently available on additional correlates at play in the relationships between sport practice, SPA and DEAB among adolescents. Consequently, it is important for future research to devote attention to the replication, and extension, of the current findings among adolescents. Clearly, culture is known to play an important role in the definition of body shape ideals [e.g., 71, 72] and thus may exert a significant impact on the relationships observed in the current study.

Second, this study represent the first attempt in the literature to examine whether involvement in sport practice and in specific types and contexts of sport practice, may represent a healthy or unhealthy setting for adolescents with high levels of self-presentation concerns in terms of favoring, or limiting expressions of DEAB. Overall, the current findings suggest that the involvement in sport practice is not in itself significantly related to higher levels DEAB, or to more pronounced relations between SPA and DEAB. In fact, involvement in sport practice is even associated with lower levels of DEAB among boys. When we look more precisely at various types and contexts of sports practice, the only exception,

individual sports are the only type of sports that apparently are somehow related to a more pronounced relation between SPA and DEAB. Nevertheless, regarding the limited number of studies on this issue and the fact this study represent one of the first systematic investigation of multiple characteristics of the sport practice context in a mixed-gender sample of adolescents, it would be premature yet to conclude that sport practice may represent a healthy or unhealthy setting for adolescents with high levels of SPA. These findings should thus be viewed as preliminary and replicated. To further extend the current results, it would interesting for future research to focus more specifically on the role of (a) body-related sport motives (i.e., weight and shape control, losing weight, improving his/her appearance), (b) social comparison processes and/or social physique pressure, and (c) sport practices' socio-contextual factors (parents, peers, coaches, etc.) on the relationships between SPA, gender, sport practice, and DEAB.

From a practical standpoint, these results also have potentially important implications. For instance, one strategy that clinicians may adopt to prevent or reduce the development of high levels of DEAB in adolescents, may be to focus on the reduction of high levels of physical self-presentation concerns [20, 21]. To this end they could target their interventions at helping adolescents to adopt healthy coping strategy in order to deal with SPA levels that naturally tend to increase in adolescence [20, 21]. For instance, recent work by Kowalski et al. [20] and Sabiston et al. [21] identify several mechanisms involved in the deleterious effects of SPA and strategies used by adolescents to cope with SPA that may help to guide such interventions. For instance, the critical mechanisms involved in the deleterious effects of SPA are mainly oriented toward social situation and events or messages from significant others [21], and coping strategies can be either behavioral (behavior avoidance, appearance management, eating, social support, substance use, etc.) or cognitive (cognitive avoidance, reappraisal, and deflection and comparison to others) in nature [20, 21]. Additionally, the knowledge and findings about the potentially unhealthy role of sport practices and of some of its characteristics would help the clinician to more efficiently counseling and monitoring the adolescents with high level of SPA and/or DEAB either involved or decided to be involved in sport practice. For instance, and although this results deserves replication, practitioners should remain aware of potentially risky effects of involvement in individual

sports for youth presenting high levels of self-presentation motives and, when appropriate, programs may be developed targeting specifically this context of sport practice as a potentially interesting targeted context for DEAB prevention.

Footnote

^aFor exploratory purposes, the effects of three-way interactions between SPA, gender, and involvement in sport practice (and its characteristics) were also tested. However, none of these effects were significant.

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