

**Perceived Weight-Related Victimization and Physical Activity Outcomes Among Adolescents with Overweight and Obesity: Indirect Role of Perceived Physical Abilities and Fear of Enacted Stigma**

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**Acknowledgements**

The data collection was supported by a grant from the Public Health Agency of Canada (6262-05-2012/0381194) awarded to the Association pour la santé publique du Québec. Preparation of this article was also supported in part by grants from the Social Sciences and Humanities Research Council of Canada (430-2012-0091, 435-2014-0909) and Australian Research Council (DP140101559) awarded to the first and last authors.

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This is the prepublication version of the following manuscript:

Maïano, C., Lepage, G., Aimé, A., ASPQ Team, & Morin, A. J. S. (2018). Perceived weight-related victimization and physical activity outcomes among adolescents with overweight and obesity: Indirect role of perceived physical abilities and fear of enacted stigma. *Psychology of Sport and Exercise*, 34, 70-78. doi: 10.1016/j.psychsport.2017.08.007

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Abstract

*Objectives.* Recently, victimization has been shown to be negatively related to physical activity among adolescents with overweight or obesity. However, research on this relation remains scarce and plagued by multiple limitations. The objectives of this study were twofold. First, we wanted to replicate and extend previous research among adolescents with overweight and obesity by examining the relations between perceived weight-related victimization in school-based physical activity and students' perceived physical education performance or involvement in physical activity outside school. Second, we wanted to investigate the indirect role of perceived physical abilities and fear of enacted stigma on these relations.

*Design.* A cross-sectional design was used.

*Method.* A sample of 144 secondary school students with overweight and obesity participated in this study.

*Results.* Perceived physical abilities were found to play a significant and negative indirect role in the relations between perceived weight-related victimization and students' perceived physical education performance or involvement in physical activity outside school. When sex and age were controlled for, these relations remained significant. The mediating role of fear of enacted stigma was non-significant.

*Conclusions.* Schools should implement policies that do not tolerate weight-related victimization of students and that promote a safe and positive climate during physical activities. Moreover, a personalized approach providing choices and encouragements would help youth gain confidence in their abilities to perform or engage in physical activities.

*Keywords:* weight-related victimization; physical education; sport practices; perceived physical abilities; fear of enacted stigma.

The beneficial role of physical activity (including exercise and sports) as a key component of weight control and weight loss efforts among adolescents with overweight or obesity is relatively well documented (for a recent meta-analysis see Kelley & Kelley, 2013). However, regular involvement in physical activity (PA) can be challenging, and a significant proportion of adolescents with overweight or obesity tend to remain chronically physically inactive (Schmalz, 2010). To remedy this situation, it seems relevant to identify the psychological mechanisms underlying involvement in PA among adolescents with overweight or obesity (for a review see Stankov, Olds, & Cargo, 2012). Accordingly, past research has highlighted a variety of individual (e.g., motivation, physical abilities), interpersonal (e.g., social support, family composition), and environmental (e.g., resources, coaching practices) factors that play a role in PA involvement in this population (Stankov et al., 2012).

### **Perceived Weight-Related Victimization and PA**

One of the factors likely to have a significant role in PA involvement among adolescents with overweight or obesity appears to be victimization (e.g., Puhl & Suh, 2015; Stankov et al., 2012), which is defined as “...overt (e.g., pushing, hitting, kicking) or relational (e.g., gossiping, teasing, ignoring, excluding) forms of aggression as perpetrated by an individual or a group of peers” (Gray, Kahhan, & Janicke, 2009, p. 721). Youth with overweight or obesity may be even more likely to experience victimization related to their weight or body size (i.e., weight-related victimization, or WRV) in the PA context, where their bodies and physical abilities are publicly displayed, scrutinized, compared, criticized, and judged (Pickett & Cunningham, 2016; Rukavina & Doolittle, 2016; Rukavina & Li, 2008). Exposure to WRV while involved in PA, especially when the objective of this involvement is weight control or weight loss, may be particularly harmful for youth with overweight or obesity. Indeed, it may lead them to participate less in PA for fear of further victimization (Li & Rukavina, 2012; Rukavina & Doolittle, 2016; Rukavina & Li, 2008; Stankov et al., 2012).

Moreover, because a key objective of school-based PA is to teach students the skills and knowledge needed to have a physically active lifestyle across their lifespan (Rukavina & Doolittle, 2016), WRV in this context is likely to have a counterproductive effect. It may discourage youth with overweight or obesity from participating in PA outside school and contribute to maintaining or exacerbating their sedentary lifestyle in the long term (Hayden-Wade et al., 2005; Rukavina & Doolittle, 2016; Rukavina & Li, 2008). Unfortunately, research has shown that victimization is highly prevalent in school settings (Gray et al., 2009; Puhl, 2011), particularly during school-based PA, including physical education (PE) classes (Bauer, Yang, & Austin, 2004; Cardinal, Whitney, Narimatsu, Hubert, & Souza, 2014; Ehlert, Marston, Fontana, & Waldron, 2015; Fox & Edmunds, 2000; Li & Rukavina, 2012).

So far, three studies have shown that high levels of perceived victimization are significantly related to lower levels of involvement in PA (Gray, Janicke, Ingerski, & Silverstein, 2008; Jensen, Cushing, & Elledge, 2014; Storch, Milsom, DeBraganza, Lewin, Geffken, & Silverstein, 2007). A fourth study showed that they are related to a higher preference for sedentary activities (Hayden-Wade et al., 2005). Although relevant, these results should be viewed as preliminary, given certain limitations. Indeed, except for Hayden-Wade et al. (2005), none of the previous studies considered perceived WRV. It is thus unknown whether weight was the main reason for the victimization. In a related manner, only Jensen et al. (2014) examined perceived victimization occurring specifically in the PA context. In the other studies, researchers relied on global (non-specific) measures of perceived victimization (Gray et al., 2008; Hayden-Wade et al., 2005; Storch et al., 2007). Finally, attempts have been made in two studies, focusing on generic victimization rather than WRV, to understand the mechanisms explaining the relation between victimization and PA (Gray et al., 2008; Storch et al., 2007). First, Storch et al. (2007) showed that youth with overweight

and obesity exposed to high levels of peer victimization tend to present higher levels of psychological distress (depression symptoms and loneliness) and in turn to be less physically active. Second, Gray et al. (2008) showed that perceived peer victimization led to a greater tendency to be less physically active. This relation involved the action of numerous psychological processes, such as increased likelihood of becoming more self-conscious about being physically active, concerns over not being selected by schoolmates to be on a team, or having fewer opportunities and less support to participate in PA.

The present study was designed to address these gaps by focusing on the outcomes of perceived WRV, as it occurs in the school-based PA context, on levels of perceived PE performance and PA participation outside of school of adolescents with overweight and obesity. Furthermore, this study was designed to also improve our understanding of the mechanisms involved in the relations between WRV and these PA-related outcomes.

### **Psychological Mediators of the Relations Between Perceived WRV and PA Outcomes**

**Perceived physical abilities.** Despite the lack of research focusing on psychological mechanisms that may mediate the relations between WRV and PA, theory and research related to PA involvement and performance suggest some likely variables. Among the possible significant mediators are youth's levels of perceived physical abilities (Fox & Corbin, 1989; Marsh, Richards, Johnson, Roche, & Tremayne, 1994), defined as "*self-perceptions of their skills and interest in sports, games, and physical activities*" (Marsh, Ellis, Parada, Richards, & Heubeck, 2005, p. 102).

First, some scholars have reported a significant negative relation between exposure to WRV and the self-concept among children and adolescents (e.g., Eisenberg, Neumark-Sztainer, Haines, & Wall, 2006; Eisenberg, Neumark-Sztainer, & Story, 2003). The relation between WRV and perceived physical abilities has been examined in a sample of adolescents (Greenleaf, Petrie, & Martin, 2014). The findings show that adolescents exposed to WRV tend to present lower self-conceptions of their physical abilities. This result could be explained by the fact that WRV targets physical characteristics specifically (Li & Rukavina, 2012; Rukavina & Doolittle, 2016; Rukavina & Li, 2008). WRV is therefore likely to lead exposed adolescents with overweight or obesity to internalize these negative messages about their physical characteristics into the self-representations of their physical abilities.

Second, competence motivation theory (Harter, 1978; Klint & Weiss, 1987; Weiss & Ebbeck, 1996) adds that perceived physical abilities represent a key predictor of PA participation. More precisely, proponents of this theory suggest that people are fundamentally motivated to be competent. As such, they will tend to become involved in areas where they feel most competent and most motivated to improve, and will tend to avoid areas that they see as more challenging and less appealing. Competence motivation theory thus clearly positions perceived physical abilities as a key driver of PA involvement.

Third, the self-enhancement model (Calsyn & Kenny, 1977; Marsh, 1990a; Marsh & Craven, 2006) posits perceived physical abilities as a significant predictor of PA performance. More precisely, proponents of this theory note that people who have high levels of perceived physical abilities are "*...more likely to pursue and achieve desirable outcomes in that domain than individuals who do not feel positively about themselves*" (Marsh, Chanal, & Sarrazin, 2006, p. 101; see also Marsh, Gerlach, Trautwein, Lüdtke, & Brettschneider, 2007; Marsh, Papaioannou, & Theodorakis, 2006; Marsh & Perry, 2005). According to Sonstroem (1998), this relation may be explained by the fact that individuals tend to act in accordance with their self-perceptions. Therefore, adolescents with a positive view of their physical abilities should tend to perform physically in ways that are consistent with their perception. They would achieve higher levels of PA performance, likely due to more engagement during PA practice (Valentine, DuBois, & Cooper, 2004). Conversely, adolescents with more negative views of their physical abilities should be less likely to be engaged during PA practice, and should thus

have lower levels of PA performance.

**Internalization of WRV experiences.** Another potentially significant psychological mediator of the relation between perceived WRV and PA-related outcomes for youth with overweight or obesity is the internalization of these WRV experiences into a more stigmatized self-identity. More precisely, the content of WRV can be internalized by exposed adolescents who come to accept these negative stereotypes and attributes about their weight (Ratcliffe & Ellison, 2015). One key component of this mediator is fear of enacted stigma (Lillis, Luoma, Levin, & Hayes, 2010). Developed specifically for use among people with overweight or obesity, the concept of fear of enacted stigma refers to their internalization of beliefs that the way others interact with them or think about them is based primarily on their weight (Lillis et al., 2010). Youth with high levels of fear of enacted stigma who are weight-victimized during school-based PA could be particularly at risk of being less physically active or of avoiding PA outside of the school setting. Recently, Pearl, Puhl, and Dovidio (2015) examined a sample of women with overweight and obesity and found that weight bias internalization was a significant partial mediator of the relation between experienced weight stigma (i.e., being: teased, treated unfairly, discriminated against because of body weight) and exercise behavior. However, given that this study was conducted among women, it remains unknown whether these results can be generalized to a mixed-sex sample of adolescents. Additionally, it is still unknown whether adolescents with high levels of fear of enacted stigma who are frequently weight-victimized during school-based PA tend to underachieve academically in PA during PE classes.

### **The Present Study**

In this study, we pursued two objectives. First, we sought to replicate and extend previous research among adolescents with overweight or obesity (Gray et al., 2008; Hayden-Wade et al., 2005; Jensen et al., 2014; Storch et al., 2007) by examining the possible outcomes of perceived WRV occurring in school-based PA settings. Based on previous results, we hypothesized that more frequent exposure to perceived WRV would be related to lower levels of perceived PE performance and to less frequent involvement in PA outside the school setting.

The second objective was to investigate the possible mediating role of perceived physical abilities and fear of enacted stigma in the relation between the frequency of perceived WRV and PA-related outcomes. For this investigation, we used the model illustrated in Figure 1, where the full arrows represent a fully mediated (FM) model.

More precisely, in accordance with the self-enhancement model and the competence motivation theory, we hypothesized that in adolescents with overweight and obesity: (a) higher frequencies of perceived WRV in school-based PA would be associated with lower levels of perceived physical abilities (path A1); and (b) lower levels of perceived physical abilities would be associated with lower levels of perceived PE performance (B1) in PA, and of involvement in PA outside school (B2).

Additionally, in accordance with Pearl et al.'s (2015) results, we hypothesized that in adolescents with overweight and obesity: (a) higher frequencies of perceived WRV would be related to higher levels of fear of enacted stigma (A2); and (b) higher levels of fear of enacted stigma would also be related to lower levels of perceived PE performance (C1) in PA, and of involvement in PA outside school (C2).

We also examined a partial mediation (PM) model by incorporating the dashed arrows from Figure 1 to depict the direct relations between perceived WRV and perceived PE performance (Path A3) or involvement in PA outside school (A4). This PM model made it possible to test whether the direct relations between perceived WRV and PA-related outcomes were significant or not when the mediators were considered.

Finally, given that this study included a mixed-sex and mixed-age sample of

adolescents with overweight and obesity, the effects of these variables in the model were controlled for as illustrated by the dotted lines in Figure 1. In fact, past research suggests that, contrary to boys with overweight or obesity, girls in the same weight categories tend to present lower levels of perceived physical abilities (e.g., Hau, Sung, Yu, Marsh, & Lau, 2005; Marsh et al., 2007; Sung, Yu, So, Lam, & Hau, 2005) and higher levels of weight bias internalization (Carels et al., 2013; Hilbert, Baldofski, Zenger, Löwe, Kersting, & Braehler, 2014; Innamorati et al., 2016; O'Brien et al., 2016; Pearl & Puhl, 2014). Additionally, some researchers have also suggested that age may predict perceived physical abilities and weight bias internalization (Allison, Dwyer, & Makin, 1999; but for counter-evidence see Gray et al., 2008; Zabinski, Saelens, Stein, Hayden-Wade, & Wilfley, 2003).

## Method

### Participants

As part of a larger study which examined weight stigmatization, physical self-conceptions and their correlates among adolescents, a sample of 835 youth (aged between 14 and 19 years) was recruited in 78 secondary schools located in various regions of the Province of Québec (Canada). For the purposes of the present study, participants were included if they (1) were either overweight or obese; and (2) were not exempted from the mandatory PE classes during the current school year. The final sample included 144 adolescents with overweight (76.4%) or obesity (23.6%) aged between 14 and 18 years ( $M_{age} = 16.32$ ,  $SD_{age} = .83$ ), including 69 girls and 75 boys.

### Measures

**Demographic and Anthropometric Characteristics.** The adolescents were asked to self-report their sex (coded 0 girls and 1 boys), age, weight, and height. To control for possible self-report biases and counter the tendency to underestimate weight and overestimate height (Brettschneider et al., 2015), a correction formula considering the adolescents' sex and age (equations 7, 9, 13, and 14 in Brettschneider et al., 2015) was applied. The corrected weight and height were then used to estimate participants' body mass index [ $BMI = \text{Weight}/(\text{Height} \times \text{Height})$ ]. Participants' BMI categories were determined based on the sex- and age-specific BMI revised cut-off scores provided by the International Obesity Task Force (Cole & Lobstein, 2012).

**Perceived WRV in School-Based PA.** Puhl and Luedicke (2012) developed a 28-item questionnaire aiming to assess the frequency of adolescents' exposure to various forms of weight-related teasing or bullying (verbal, physical, relational, and cyberbullying) in the past school year. From this questionnaire, two items were selected, back-translated, and retained for the purposes of this study because they were designed to assess WRV specifically in school-based PA [ $\alpha = .748$ ; i.e., "*In the past year, how often have the following things happened to you at school because of your weight? (1) Being teased/made fun of about your weight during gym classes or sports practices; (2) Being excluded from physical activities (e.g., sports, extracurricular activities) by peers at school because of your weight*"]. The adolescents rated them using a five-point scale ranging from *never* (1) to *very often* (5).

**Perceived PE Performance.** We assessed the adolescents' perceived PE performance based on their self-reported PE class grades using an item developed specifically for this study. Participants were asked to report their performance in PE classes using the following four-point scale: *failing* (1), *under class average* (2), *within class average* (3), or *above class average* (4).

**Involvement in PA Outside the School Setting.** We measured adolescents' involvement in PA outside the school setting (i.e., frequency of PA participation in the last week) using two items specifically developed for this study. Participants were first asked whether they were or were not involved in PA outside the school setting (i.e., "*Do you practice a physical activity or a sport outside of school?*"). If yes, they were asked to indicate

how often they had practiced the PA in the past week (i.e., “*How many times in the last week have you practiced this physical activity or sport outside of school?*”). Responses were coded as a single continuous variable, with a value of zero being attributed to students who had not participated in PA during the past week.

**Perceived Physical Abilities.** The physical abilities subscale from the French version of the Self-Description Questionnaire II (Marsh, 1990b) validated by Guérin, Marsh, and Famose (2003) was used. This subscale comprises eight items ( $\alpha = .861$ ; e.g., “*I am good at things like sports, gym, and dance*”; “*I enjoy things like sports, gym, and dance*”) that participants rated using a six-point scale ranging from *false* (1) to *true* (6).

**Fear of Enacted Stigma.** We measured participants’ internalized weight stigma using a French back-translation of the fear of enacted stigma subscale of the Weight Self-Stigma Questionnaire (Lillis et al., 2010), which is specifically designed for a population of people with overweight or obesity. The subscale comprises six items ( $\alpha = .830$ ; e.g., “*People think that I am to blame for my weight problems*”; “*People discriminate against me because I’ve had weight problems*”) that participants rated using a five-point scale ranging from *completely disagree* (1) to *completely agree* (5).

### Procedures

The larger study was approved by the research ethics committee of the Université du Québec en Outaouais, and by the school boards of the participating establishments. Participants were recruited by the Association pour la santé publique du Québec between November 2013 and March 2014. The adolescents’ parents or legal representatives were informed of the purpose of the larger study through an information letter sent by the school. The letter provided contact information so parents who did not want their adolescent to participate in the study, or who had further questions, could contact the research team. When parents refused participation in the study, the adolescent was excluded. Students were informed of the study through posters and information booths located in school cafeterias. Those interested in participating in the study had to fill out an online informed consent form, after which they were invited to complete an online questionnaire. The measures included in the present study were thus part of a broader questionnaire used in the larger study. This broader questionnaire comprised 10 sections (e.g., demographics, weight stigmatization, physical self-conceptions, disordered eating, etc.) that took the adolescents approximately 45 to 60 minutes to complete. Participants were eligible for a draw to win one of six possible prizes (i.e., an iPad and five gift certificates of \$100 each).

### Data Analyses

We estimated the FM and PM models illustrated in Figure 1 using structural equation modeling (SEM). Both models included 14 manifest indicators forming three latent variables (represented as circles) measuring perceived WRV (two indicators<sup>1</sup>), perceived physical abilities (eight indicators) and fear of enacted stigma (six indicators), and two observed variables (represented as rectangles) measuring perceived PE performance and involvement in PA outside school. We conducted analyses in three steps using the robust weighted least squares (WLSMV) estimator available in Mplus 7.4 (Muthén & Muthén, 2015). This estimator was selected because it is naturally suited to the ordered categorical nature and asymmetric response thresholds of the response scales used in this study (Finney & DiStefano, 2013). To account for the missing responses at the item levels and for the observed variables ( $M = 9.4\%$ ), we estimated the models based on the full available information using the algorithms implemented in Mplus for WLSMV (Asparouhov & Muthén, 2010).

First, we examined the factor validity and reliability of the three latent variables (perceived WRV, perceived physical abilities, and fear of enacted stigma) using confirmatory factor analyses (CFA). We computed the composite reliability of the factors using McDonald’s (1970) omega ( $\omega$ ) based on standardized parameter estimates.

Second, we estimated the predictive model described in Figure 1 and contrasted solutions involving FM and PM. We estimated these initial solutions without controlling for sex and age. To allow comparison between these models and later models, we still included sex and age in these models and allowed them to correlate with the predictor (perceived WRV). However, we constrained their regression paths to the mediators and the outcomes to be zero. Only the best model (FM or PM) was retained for the third step.

Third, a final solution (FM or PM, based on the results from the second step) controlling for the effect of adolescents' sex and age on the hypothesized relations was estimated. To assess the need to control for the effects of these variables, we compared this model with that of the best initial solution (FM or PM) that did not control for participants' sex and age.

As recommended in the literature (e.g., Hu & Bentler, 1999; Marsh, Hau, & Grayson, 2005; Yu, 2002), we used multiple indicators to examine the fit of the CFA and SEM to the data: the chi-square test of exact fit ( $\chi^2$ ), the comparative fit index ( $CFI \geq .90$  or  $> .95$ ), the Tucker-Lewis index ( $TLI \geq .90$  or  $> .95$ ), the root mean square error of approximation ( $RMSEA \leq .08$  or  $< .06$ ), and the 90% confidence interval of the RMSEA. Moreover, we compared goodness of fit between the FM model and the PM model, and between those controlling or not controlling for participants' sex and age using the  $\chi^2$  difference tests estimated with the Mplus DIFFTEST function ( $MD\Delta\chi^2$ ; Muthén & Muthén, 2015). As also recommended (Chen, 2007; Cheung & Rensvold, 2002), we compared the nested solutions by examining parameter estimates and changes in goodness of fit indices. Finally, we examined the significance of the indirect effects using bias-corrected (BC) bootstrap 95% confidence intervals (95% CI), based on 1,000 bootstrap samples (Cheung & Lau, 2008; Lau & Cheung, 2012). An indirect effect is statistically significant when the CI excludes zero.

## Results

### Factor Validity and Reliability of the Latent Variables

The initial CFA model resulted in a satisfactory fit to the data ( $\chi^2 = 143.47$ ,  $df = 102$ ,  $p < .001$ ;  $CFI = .977$ ,  $TLI = .973$ ,  $RMSEA = .053$ ;  $RMSEA$  90% CI = .031-.082), supporting the factor validity of the three latent variables (perceived WRV, perceived physical abilities, and fear of enacted stigma). As illustrated in Figure S1 of the online supplements, all loadings were significant and substantial, and the latent correlations were, as expected, significant and negative (between perceived physical abilities and perceived WRV; and between perceived physical abilities and fear of enacted stigma) or positive (between perceived WRV and fear of enacted stigma). Finally, the composite reliability of these latent variables was good to excellent (perceived WRV:  $\omega = .888$ ; fear of enacted stigma:  $\omega = .920$ ; perceived physical abilities:  $\omega = .905$ ).

### Correlations Between the Latent and Observed Variables

Correlations between the latent and observed variables are presented in Table 1. Results show that perceived WRV and perceived physical abilities were significantly correlated with all the variables, except for involvement in PA outside school (only for perceived WRV) and age. Similarly, perceived PE performance and involvement in PA outside school were significantly correlated with all the variables, except for age, fear of enacted stigma, and perceived WRV (only for involvement in PA outside school). Finally, fear of enacted stigma was negatively correlated with participants' sex and perceived WRV.

### Comparison of the Fully and Partially Mediated Models

Findings from the FM solution ( $\chi^2 = 229.42$ ,  $df = 164$ ,  $p < .001$ ;  $CFI = .968$ ,  $TLI = .963$ ,  $RMSEA = .053$ ;  $RMSEA$  90% CI = .035-.068) resulted in a satisfactory fit to the data. Furthermore, the PM solution, where the direct paths were added from the predictor to the outcomes ( $\chi^2 = 227.86$ ,  $df = 162$ ,  $p < .001$ ;  $CFI = .968$ ,  $TLI = .962$ ,  $RMSEA = .053$ ;  $RMSEA$  90% CI = .036-.069), did not provide substantially better fit indices compared with

the FM solution ( $MD\Delta\chi^2 = 1.31$ ,  $df = 2$ ,  $p = .52$ ;  $\Delta CFI = .000$ ,  $\Delta TLI = -.001$ ,  $\Delta RMSEA = .000$ ). In fact, examination of the parameter estimates from the PM solution revealed that neither of these direct paths was significantly different from zero (path A3:  $\beta = -.256$ ,  $SE = .245$ ,  $p = .30$ ; path A4:  $\beta = -.102$ ,  $SE = .216$ ,  $p = .64$ ). Therefore, the simplest solution (FM) was preferred and retained for subsequent analyses.

Adding sex and age as control variables to the FM model resulted in a satisfactory fit to the data ( $\chi^2 = 222.49$ ,  $df = 156$ ,  $p < .001$ ;  $CFI = .967$ ,  $TLI = .960$ ,  $RMSEA = .054$ ;  $RMSEA$  90% CI = .037-.070). Examination of the parameter estimates revealed that most of the regression paths from sex and age were non-significant, the exceptions being the ones to involvement in PA outside school. More precisely, boys ( $\beta = .259$ ,  $SE = .081$ ;  $p = .001$ ) and older adolescents ( $\beta = .187$ ,  $SE = .070$ ;  $p = .008$ ) tended to present higher levels of involvement in PA outside school than girls and younger adolescents, respectively. However, this solution did not provide substantially better fit to the data than the more parsimonious FM solution in which these effects were constrained to be zero ( $MD\Delta\chi^2 = 11.32$ ,  $df = 8$ ,  $p = .18$ ;  $\Delta CFI = -.001$ ,  $\Delta TLI = -.003$ ,  $\Delta RMSEA = .001$ ). Consequently, the FM model not controlled for sex and age was retained as the final model.

Findings from this final solution are presented in Figure 2. This model accounted for 34% of the variance in participants' perceived physical abilities, 56% of the variance in participants' fear of enacted stigma, 47% of the variance in participants' perceived PE performance, and 16% of the variance in participants' involvement in PA outside school. More precisely: (a) perceived WRV significantly and negatively predicted perceived physical abilities, and positively predicted fear of enacted stigma; (b) perceived physical abilities significantly and positively predicted perceived PE performance and PA involvement outside school. Finally, fear of enacted stigma was not a significant predictor of perceived PE performance or of involvement in PA.

In addition, these results also revealed a significant negative indirect role of perceived physical abilities in the relation between perceived WRV and perceived PE performance ( $\beta = -.400$ ,  $SE = .063$ ,  $p < .001$ , BC bootstrap 95% CI =  $-.609$  to  $-.238$ ) and between perceived WRV and involvement in PA outside school ( $\beta = -.229$ ,  $SE = .038$ ,  $p < .001$ , BC bootstrap 95% CI =  $-.396$  to  $-.100$ ). However, the indirect role of fear of enacted stigma on the relation between perceived WRV and perceived PE performance ( $\beta = .006$ ,  $SE = .062$ ,  $p = .93$ , BC bootstrap 95% CI =  $-.127$  to  $.135$ ) and between perceived WRV and involvement in PA outside school ( $\beta = -.022$ ,  $SE = .070$ ,  $p = .76$ , BC bootstrap 95% CI =  $-.203$  to  $.139$ ) were non-significant.

## Discussion

The first objective of this study was to investigate the relations between the frequency of perceived WRV among youth with overweight and obesity engaged in school-based PA and PA-related outcomes, such as perceived PE performance and involvement in PA outside the school setting. According to the results, youth who experience WRV more frequently while engaging in school-based PA also tend to report lower levels of perceived PE performance. As noted by Greenleaf and Weiller (2005), youth with overweight and obesity are often exposed to negative bias and lower expectations from their PE instructors regarding their ability to perform well in PA, and this may be reflected in their actual grades. The present results further suggest that being exposed to WRV in school may also result in lower levels of perceived PE performance. However, it is interesting to note that perceived WRV experiences occurring in school settings do not directly predict levels of involvement in PA outside school settings among youth with overweight and obesity, suggesting that the two settings are relatively independent. In contrast with the results from some previous studies (Gray et al., 2008; Hayden-Wade et al., 2005; Jensen et al., 2014; Storch et al., 2007), it seems that perceived WRV could be negatively related to perceived PE performance, but that

this relation may not systematically generalize to other settings. Thus, youth with overweight and obesity may still engage in PA outside of school, where their PA performance is not evaluated by a teacher and is less likely to be scrutinized by their peers.

The second objective of this study was to examine the mediating role of perceived physical abilities and fear of enacted stigma in the relations between perceived WRV and PA outcomes. As posited by the self-enhancement model and competence motivation theory, the results show that adolescents with overweight and obesity who are more frequently exposed to WRV tend to report lower levels of perceived physical abilities, which in turn are related to lower levels perceived PE performance, as well as to lower levels of PA involvement outside the school setting. As noted by Rukavina and Doolittle (2016), some adolescents with overweight or obesity could exhibit a lack of motor skills and physical fitness (due to physical limitations, inadequate ability, or medical issues) that could attract unwanted attention during PA. Being frequently teased because of their lower physical abilities, they may come to internalize the belief that they are less physically competent than their normal-weight peers. In this situation, their lesser perceived physical abilities may constitute a psychological barrier to their success in PE classes as well as to their involvement in PA outside the school setting. Additionally, based on Harter's (1986) discounting hypothesis, the degree of internalization of the negative messages conveyed by WRV may depend on how important it is for these youth to be physically competent. According to Harter (1986), individuals can preserve their self-concept by attributing more importance to the domains in which they feel competent and by discounting the importance of domains in which they are less competent. Therefore, the internalization of these negative messages may be more detrimental for youth attributing more importance to being physically competent than for those discounting this domain. Still, further research would be needed to consider this possibility, while considering the fact the various questions that have been raised about this hypothesis during the past decades (e.g., Manus & Killeen, 1995; Marsh, 2008).

Since the results appeared unchanged by characteristics like sex and age, negative perceived physical abilities seem likely to be harmful to perceived PE performance and participation in PA outside school of adolescents of all ages, and of both sexes. Therefore, this factor appears to play a determining role in PA across contexts. Developing intervention strategies appears particularly critical to limit the deleterious effects of perceived WRV on youth's perceived physical abilities.

Contrary to expectations, the results did not support the idea that fear of enacted stigma mediates the relation between perceived WRV and PA-related outcomes. Although exposure to WRV was found to predict internalization of weight stigma among youth with overweight and obesity, such internalization did not predict their perceived PE performance levels or their involvement in PA outside the school setting. These results thus suggest that, even though perceived WRV is positively related to internalization of weight stigmatization, the resulting fear of being further stigmatized does not translate to lower perceived PE performance or to a greater tendency to avoid PA outside school. They differ slightly from those of Pearl et al. (2015), who found not only a direct association between weight stigma and exercise levels in women with overweight and obesity, but also an indirect association through weight bias internalization as a partial mediator. This discrepancy may be explained by a developmental gap between the participants of the two studies, possibly due to weight stigma being more deeply internalized during adulthood than during adolescence. Indeed, the adults in Pearl et al.'s sample may have internalized the content of weight stigma over a much longer developmental period, crystallizing the association and making it more salient than for the adolescents in the present study. Additionally, it is also probable that the indirect role of weight bias internalization was stronger in Pearl et al.'s study because their sample included women only. It is indeed well documented that women tend to present significantly higher

levels of weight bias internalization than men do (Carels et al., 2013; Hilbert et al., 2014; Innamorati et al., 2016; O'Brien et al., 2016; Pearl & Puhl, 2014). Finally, it is also possible that fear of enacted stigma may significantly predict PA performance and avoidance through other mechanisms, such as anxiety or depression (Lillis et al., 2010; Puhl, 2011; Roberto et al., 2012; Storch et al., 2007). However, this possibility was not verified in this study or in the one by Pearl et al. In sum, the results suggest that fear of enacted stigma may not be the key mechanism at play in explaining the relation between perceived WRV and PA-related outcomes.

Although they represent a valuable contribution to the literature, the current results should be interpreted with caution, given certain limitations. First, the hypothesized relations were examined in a small sample of adolescents with overweight and obesity aged between 14 and 18 years. Therefore, it is unknown whether these results may generalize to a larger sample of youth of different ages (e.g., children, young adults), and whether the pattern of relations examined is invariant or not between adolescents with overweight and obesity.

Second, the cross-sectional nature of this study made it impossible to clearly assess the directionality of the associations, particularly those between perceived physical abilities and perceived PE performance. Indeed, as discussed in Marsh and Craven's (2006) review, PA performance also predicts perceived physical abilities, so that these two constructs are reciprocally related. Consequently, so called "causal-ordering" studies (Marsh, 1990a) are needed to disentangle the directionality of the relation between these variables.

Third, we assessed perceived WRV using only two items, one capturing verbal victimization and the other, relational victimization. Consequently, although physical WRV may be less likely to occur among adolescents during school-based PA, its role in the observed pattern of relations remains unknown. Additionally, both items assessed only one source of perceived WRV (i.e., peers). It would be highly relevant in future research to look also at the possible role of PA instructors in WRV, while considering the physical, verbal, and relational components of perceived WRV.

Fourth, the perceived physical abilities scale used in this study is a general measure of physical self-perceptions. However, as demonstrated by Fox and Corbin (1989) and Marsh et al. (1994), physical self-perceptions are inherently multidimensional (e.g., global physical self-perceptions, sport competence, physical condition, physical strength, flexibility, coordination). It is thus unknown whether some of the observed relations might differ across various facets of adolescents' physical self-perceptions.

Fifth, we relied on in-house single-item self-reported measures of perceived PE performance and of involvement in PA outside the school context. For the first item, students were asked to indicate how their performance in PE class compared to the class average. Research has shown that such social comparison processes are well aligned with the way class grades are allocated by teachers and provide valuable complementary information to standardized achievement tests (Arens, & Morin, 2016; Arens, Morin & Waterman, 2015; Marsh, Kuyper, Morin, Parker & Seaton, 2014; Marsh, Kuyper, Seaton et al., 2014). Nonetheless, the fact remains that such self-report assessments are, at best, imperfect indicators of objective class grades (Kuncel, Credé, & Thomas, 2005), and that reliance on single-item measures to assess perceived PE performance made it impossible to control for the random measurement errors present in these ratings. Fortunately, measurement errors found in ratings of an outcome variable (as in this study) are known to exert no biasing effects of estimated relations among constructs (e.g., Kline, 2016). It would still be interesting in future research to consider a more objective indicator of students' perceived PE performance, for instance through direct observations or use of official school records.

In the second item, which concerned PA involvement, students were asked to indicate how frequently they had participated in PA outside of school in the last week. Yet, frequency

represents only one component of PA involvement, and should be complemented by additional indicators of intensity (low, moderate or vigorous), duration, and activity type. Moreover, the assessment period (one week) may not fully represent the true PA behaviors of adolescents with overweight or obesity. Therefore, it would be interesting, in future studies, to measure PA involvement over a longer and more representative period (e.g., month) while relying on multiple indicators (intensity, duration, frequency, and activity type).

Nonetheless, the results of this study have practical implications for schools, PA instructors, and school professionals that are worth mentioning. First, they suggest that actions should be taken to counteract any type of weight-related victimization in schools. In fact, WRV is frequently observed among youth (Gray et al., 2009; Puhl, 2011), and schools have a responsibility to provide a safe and bullying-free environment where students of all shapes and sizes have equal opportunities to succeed academically and develop their physical skills. To this effect, Rukavina and Doolittle (2016) recommend establishing a safe and positive class climate where teasing and bullying is not tolerated. To meet this objective, school PA instructors can rely on four simple strategies exposed in greater detail in Rukavina and Doolittle (2016): (1) establish and manage positive class behaviors (reinforce good behaviors, intervene quickly and privately when negative behaviors occur); (2) model pro-social behaviors (be courteous, model cooperative and helpful behaviors); (3) highlight the strengths and abilities of students with overweight and obesity (compliment good performance and behaviors, credit teamwork and generosity); and (4) use proactive social grouping (define class rules for partner selection, use various types of grouping).

Second, the present results indicate a need to use a personalized approach for students at risk of developing negative perceptions of their physical abilities, including those having experienced WRV (Rukavina & Doolittle, 2016). Given its major role as a mediator of the relations between perceived WRV and students' perceptions of PE performance and involvement in PA outside the school setting, opportunities to develop better perceived physical abilities should be offered in school. In this regard, PA instructors must try to motivate students with overweight and obesity to become more active in PA settings, and to work at improving their physical abilities. To do so, PA instructors can rely on strategies presented in greater detail in Rukavina and Doolittle (2016): (1) avoid spotlighting and social comparisons (keep all students active, record individual scores privately); (2) provide choices or skill variations (use various sizes of equipment, propose various types of exercises); (3) encourage effort and adjust individual goals (reinforce small achievements, avoid non-active behaviors); and (4) implement task progression and accountability (provide ways to enhance stamina, help students set achievable progressive fitness goals). While developing a more positive perception of their physical abilities, youth may also develop greater general self-esteem. They would thus be better equipped to stand against any form of stigmatization and better protected from the deleterious consequences of weight stigma.

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#### Endnote

<sup>1</sup> Because this latent variable has only two indicators, an essentially tau-equivalent constraint (i.e., fixing both loadings to be equal) was used to achieve local identification of the latent constructs at the true centroid of both indicators (Little, Lindenberger, & Nesselrode, 1999).

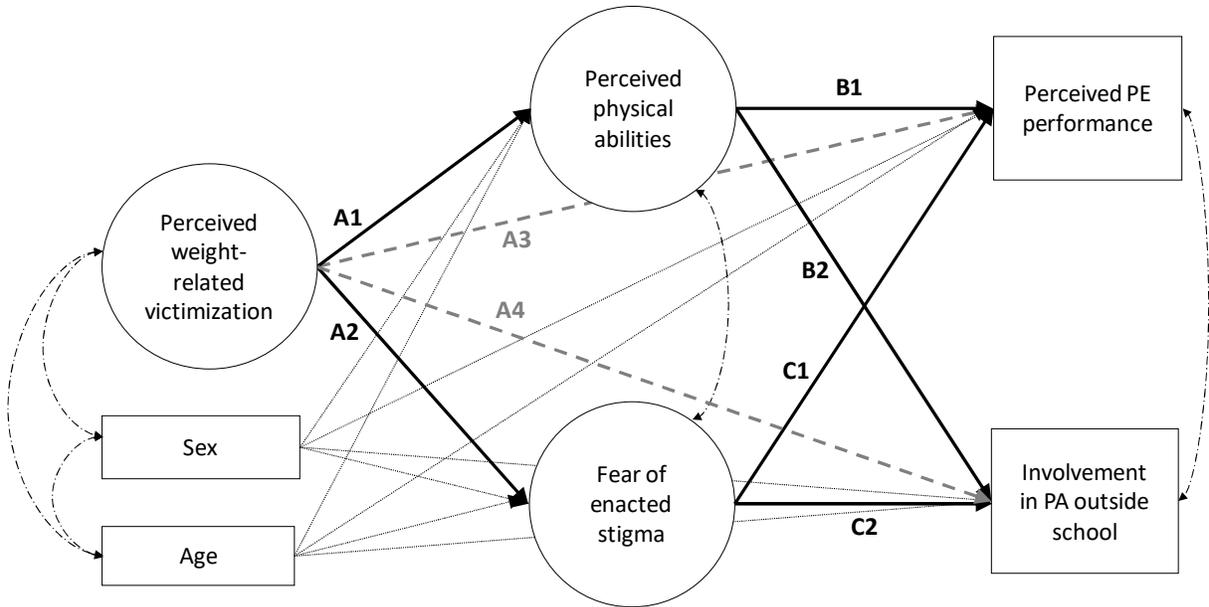


Figure 1. Illustrations of the Hypothesized Fully and Partially Mediated Models Including Sex and Age as Control Variables.

Note. PE = physical education; PA = physical activity. The full arrows reflect a Fully Mediated (FM) model. Partial mediation (PM) will be tested by including the paths depicted through the dashed arrows. Finally, the effects of controls (sex and age) will be tested by contrasting models including the dotted arrows with models where these paths are constrained to be zero.

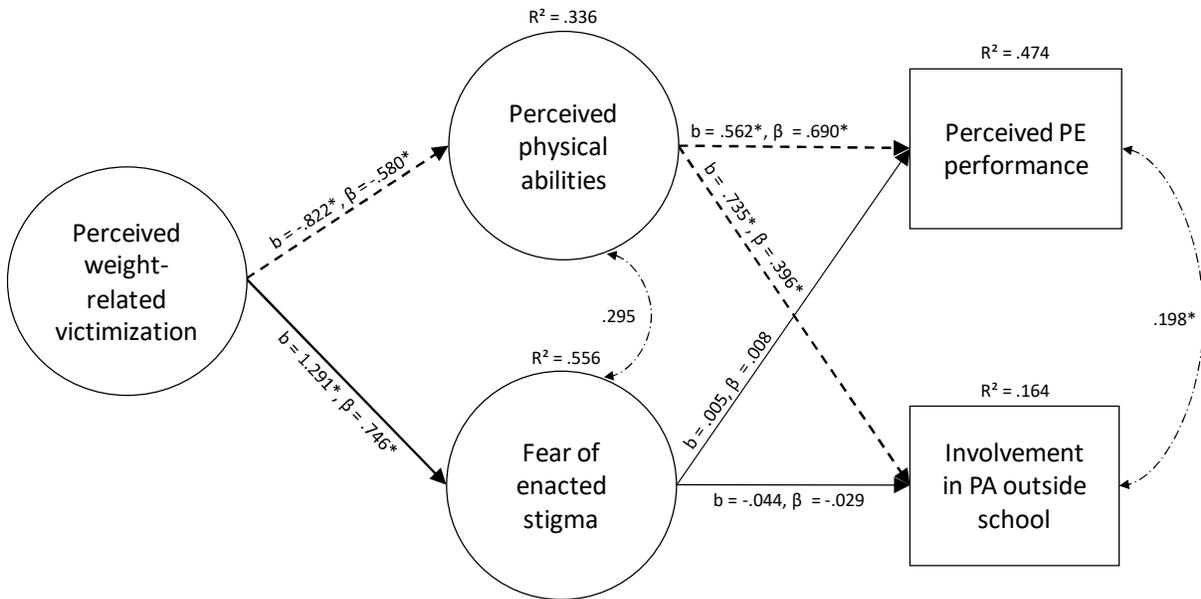


Figure 2. Parameter Estimates for the Fully Mediated Model Excluding Sex and Age as Control Variables.

Note.  $b$  = unstandardized parameter;  $\beta$  = standardized parameter; PE = physical education; PA = physical activity.

The thick arrows indicate significant relations. The thick and dashed arrows indicate that perceived physical abilities were found to be a significant mediator of the relations between perceived weight-related victimization and perceived PE performance or involvement in PA outside school.

\*  $p < .01$ .

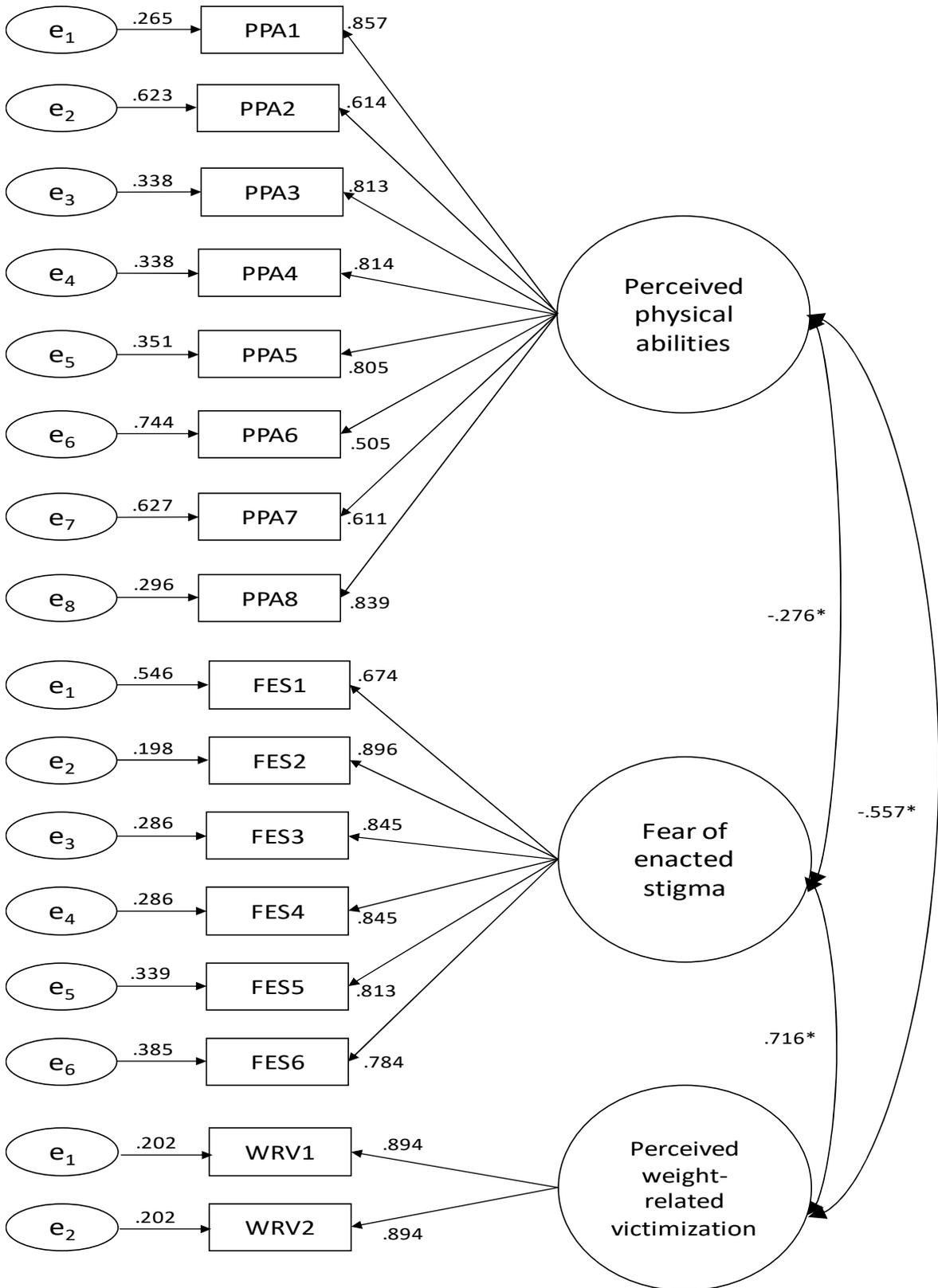
**Table 1**  
*Correlations Between Latent and Observed Variables*

	Perceived weight-related victimization	Perceived physical abilities	Fear of enacted stigma	Perceived PE performance	Involvement in PA outside school	Sex	Age
Perceived weight-related victimization	-						
Perceived physical abilities	-.556*	-					
Fear of enacted stigma	.717*	-.276*	-				
Perceived PE performance	-.380*	.682*	-.159	-			
Involvement in PA outside school	-.150	.402*	-.130	.409*	-		
Sex (girls = 0; boys = 1)	-.392*	.286*	-.404*	.321*	.317*	-	
Age	.075	-.058	-.065	.027	.145	-.026	-

*Note.* PE = physical education; PA = physical activity; \* $p < .01$

Supplemental Materials for:  
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**Figure S1.** Standardized Loadings, Uniquenesses, and Latent Correlations.



**Figure S1.** Standardized Loadings, Uniquenesses, and Latent Correlations.  
 Note. FES = fear of enacted stigma; PPA = perceived physical abilities; WRV = perceived weight-related victimization; all loadings are significant at  $p < .01$ .  $*p < .01$ .