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RESEARCH NOTES

The Moderating Role of Physical Self-Perceptions in the Relationship Between Maturity Status and Physical Self-Worth

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ABSTRACT

Purpose: We tested the moderating role of physical self-perceptions in the relationship between physical maturity and physical self-worth (PSW). **Method:** Students in Grades 5 through 8 ($N = 241$; 57% females; $M_{\text{age}} = 12.30$ years) completed a questionnaire assessing physical self-perceptions (i.e., perceived sport competence, conditioning, strength, and body attractiveness), PSW, and maturity status. Hierarchical multiple regression was used to test interactions between maturity and physical self-perceptions predicting PSW separately for boys and girls. **Results:** For girls, maturity level and physical self-perceptions explained significant variance, $F(5, 131) = 73.44$, $p < .001$, $R^2 = .74$, with interactions explaining a little extra variance, $\Delta F = 3.42$, $p = .01$, $\Delta R^2 = .03$. Perceived attractiveness interacted with maturity status to predict PSW ($p = .01$), indicating that maturity was positively related to PSW only for girls with higher body attractiveness. Maturity status and physical self-perceptions also significantly predicted PSW in boys, $F(5, 98) = 46.52$, $p < .001$, $R^2 = .70$, with interactions explaining a little extra variance, $\Delta F = 3.16$, $p = .02$, $\Delta R^2 = .04$. A statistically significant interaction between perceived strength and maturity ($p < .001$) indicated that maturity related positively to PSW, but only for boys with higher perceived strength. **Conclusions:** The maturity–PSW relationship differs by gender and depends partly on physical self-perceptions. This finding reinforces previous findings that illustrate the relative importance of perceived attractiveness and strength for girls and boys, respectively. PSW is an important predictor of physical activity behavior; therefore, it is critical to understand the interplay between these key antecedents.

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Though social, cultural, psychological, and environmental factors have frequently been examined to explain typical declines in physical activity (Sallis, Prochaska, & Taylor, 2000) that are observed during adolescence (Wall, Carlson, Stein, Lee, & Fulton, 2011), biological factors are often overlooked (see Cumming et al., 2011, 2012). This is somewhat surprising given that biological factors related to puberty and physical maturity are particularly relevant to the adolescent period of development and coincide with an overall decline in physical activity (Malina, Bouchard, & Bar-Or, 2004). Physical changes associated with puberty in girls reflect an increase in adiposity (i.e., fat mass) that is not accompanied by equivalent gains in lean body mass and can reduce fitness when expressed relative to body mass (Malina et al., 2004). While these changes in body composition and relative fitness are normal for girls during this transition to adulthood, they may discourage physical activity behaviors and decrease opportunities for competitive sport experience (Summers-Effler, 2004). Further, some

evidence suggests that girls who experience maturational changes earlier than their peers are less physically active (e.g., Sherar, Esliger, Baxter-Jones, & Tremblay, 2007), though other research fails to support this relationship longitudinally (Cumming, Sherar, Esliger, Riddoch, & Malina, 2014). In contrast to girls, boys tend to experience greater gains in lean body mass relative to fat mass during puberty (Malina et al., 2004). However, the relationship between maturation and physical activity in boys is even murkier and far more limited (e.g., Finne, Bucksch, Lampert, & Kolip, 2011; van Jaarsveld, Fidler, Simon, & Wardle, 2007).

Recently, Cumming and colleagues (Cumming et al., 2011, 2012) found support for a mediated effects model for physical activity contexts that was derived from Petersen and Taylor's (1980) model of biopsychosocial development. Specifically, Cumming and colleagues proposed a biocultural model of maturity-associated variation in physical activity whereby physical maturity best explains change in physical activity behavior

indirectly through various mediators or moderators (see Cumming et al., 2012). In line with this model, they tested the mediating role of specific physical self-perceptions (perceived sport competence, strength, conditioning, body attractiveness) and physical self-worth (PSW; i.e., overall evaluation of the physical self) in explaining the relationship between maturity status and physical activity behavior in adolescent girls (Cumming et al., 2011). Examination of PSW is important because it has been shown to be a strong predictor of moderate-to-vigorous activity among boys and girls (Raudsepp, Liblik, & Hannus, 2002). Cumming et al.'s (2011) results supported a mediational model in which maturity status predicted specific physical self-perceptions (in a negative direction, except for perceived strength), which in turn predicted PSW and PSW predicted physical activity. Though there was a significant negative, indirect relationship between maturation and PSW, Cumming and colleagues (2011) discussed that not all girls of higher maturational status will have lower PSW but explained that it will depend on the way individual girls interpret or attach meaning to the physical changes associated with puberty. This suggests a moderation effect whereby physical maturity status may explain lower levels of PSW to the extent that maturational changes are interpreted negatively. Therefore, we would expect maturity status in girls to be negatively linked with PSW to the extent that their maturity status aligns with lower levels of perceived physical sport competence, strength, conditioning, and/or body attractiveness. Boys have been examined far less often, but the literature does reveal generally positive relationships between maturation and physical self-perceptions in boys (Fairclough & Ridgers, 2010; O'Dea & Abraham, 1999). Physical self-perceptions may also moderate the relationship between maturation and PSW in boys, and this largely overlooked population deserves more investigation.

Thus, the purpose of this study was to test the moderating role of physical self-perceptions in the relationship between maturity status and PSW separately for girls and boys during early adolescence. In girls, we expected that maturity status would have a negative relationship with PSW overall but that this main effect would be overridden by significant interactions with one or more physical self-perceptions. Specifically, we hypothesized that higher maturity status paired with lower physical self-perceptions would predict lower PSW, whereas higher maturity status paired with higher physical self-perceptions would predict higher PSW. In boys, we hypothesized that maturity status would positively predict PSW. However, similar to girls, we expected that higher maturity status in boys paired with lower physical self-perceptions would predict lower PSW,

whereas higher maturity status paired with higher physical self-perceptions would predict higher PSW.

Method

Participants and procedure

Participants were invited to participate through physical education classes at a local elementary school and middle school after the study received institutional review board approval. Those students who completed assent forms and returned signed parent consent forms were allowed to participate by completing a survey during a regularly scheduled physical education class. The final sample included 104 boys and 137 girls in Grades 5 through 8 ($M_{\text{age}} = 12.30$ years, $SD = 1.18$). Most of the students were in 6th grade (40%), with 27% in 8th grade, 20% in 7th grade, and 12% in 5th grade. The majority of students were White (71%), with the remaining students reporting Black (10.5%), Biracial/Multiracial (8.4%), Hispanic, (4.2%), American Indian (2.5%), Asian/Pacific Islander (2.1%), or Other (1.3%) ethnicity. These demographic variables were self-reported along with height and weight to calculate body mass index (BMI) in addition to the following measures.

Measures

Physical self-perceptions

The Physical Self-Perception Profile for Children (Whitehead, 1995) was used to assess perceived sport competence, conditioning (i.e., stamina), strength, body attractiveness, and PSW. Each subscale is assessed with six items to which participants respond on a scale from 1 to 4 in a structured alternative-response format. Subscale means were calculated to represent each variable in the analyses. Subscale scores have demonstrated strong internal consistency and construct validity with similar populations (Eklund, Whitehead, & Welk, 1997; Whitehead, 1995).

Maturity status

Participants reported their sexual and somatic maturity using the Pubertal Development Scale (PDS; Petersen, Crockett, Richards, & Boxer, 1988). The PDS is a nonintrusive, survey-based measure of pubertal development. We used the five items assessing growth in height, appearance of pubic hair, and skin change for boys and girls; breast development and the start of menstruation for girls; and facial hair and voice changes for boys (Petersen et al., 1988). Participants responded to the items on a scale of 1 (*no*) to 4 (*development completed*), with the exception of the items about skin changes for boys and girls and menstruation for girls, to which they responded on a scale from 1 (*no*) to 3 (*yes, definitely*).

Prior research supports the validity and reliability of the scale (Brooks-Gunn, Warren, Rosso, & Gargiulo, 1987; Petersen et al., 1988). Consistent with Petersen et al. (1988), the mean scores of the five items for boys and the five items for girls were used to represent an overall indicator of maturity status for each gender.

Data analyses

Descriptive analyses were conducted first including a one-way multivariate analysis of variance (MANOVA) to test for gender differences in PSW, perceived sport competence, conditioning, body attractiveness, and strength. Hierarchical multiple regression analyses were conducted separately for boys and girls to test the moderating role of the four specific physical self-perceptions in the relationship between maturity status and PSW. Initially, all physical self-perception variables and maturity status were centered. In the first step of each analysis, age and BMI were entered as covariates, along with the independent variables of maturity status and the four specific physical self-perceptions. In the second step, the two-way interactions between maturity status and

each of the four specific physical self-perceptions were entered. An alpha level of .05 was used as the criterion for statistical significance for all analyses.

Results

Preliminary analyses

Analysis using Little's MCAR (missing completely at random) test indicated that less than 0.5% of data for both girls ($\chi^2 = 1,290.71$, $df = 1,292$, $p = .51$) and boys ($\chi^2 = 1,053.67$, $df = 1,050$, $p = .46$) were missing completely at random at the item level. Missing data were imputed using expectation-maximization. Cronbach's alpha coefficients indicated acceptable internal consistency reliability levels for all study variables in both girls (Table 1) and boys (Table 2). Univariate skewness (-1.12 to 0.07) and kurtosis (-1.21 to 1.07) values suggested normal distributions for all study variables in both girls and boys. Means, standard deviations, and bivariate correlations were calculated separately for girls and boys (see Tables 1 and 2), while descriptive statistics for maturity status by grade and sex are shown in Table 3.

Table 1. Descriptive statistics and correlations: Girls ($n = 137$).

	1	2	3	4	5	6
1 Physical self-worth	.90					
2 Sport competence	.74** ^d	.82				
3 Conditioning	.64** ^d	.67** ^d	.88			
4 Attractiveness	.73** ^d	.49** ^c	.43** ^c	.92		
5 Strength	.53** ^c	.60** ^d	.58** ^c	.35** ^b	.89	
6 Maturity	-.19 ^a	-.22* ^b	-.10 ^a	-.27** ^b	-.10 ^a	.72
Range	1–4	1–4	1–4	1–4	1–4	1–4
<i>M</i>	3.00	2.82	2.86	2.63	2.66	2.37
<i>SD</i>	0.86	0.79	0.78	0.92	0.82	0.57

Notes. Cronbach's alpha values are on a diagonal. * $p < .05$. ** $p < .01$ (two-tailed).

^aNo correlation.

^bLow correlation.

^cModerate correlation.

^dModerately high correlation (Zhu, 2012).

Table 2. Descriptive statistics and correlations: Boys ($n = 104$).

	1	2	3	4	5	6
1 Physical self-worth	.88					
2 Sport competence	.58** ^c	.73				
3 Conditioning	.72** ^d	.68** ^d	.85			
4 Attractiveness	.77** ^d	.49** ^c	.73** ^d	.90		
5 Strength	.63** ^d	.50** ^c	.53** ^c	.53** ^c	.86	
6 Maturity	.16 ^a	-.02 ^a	.11 ^a	.04 ^a	.21* ^b	.75
Range	1–4	1–4	1–4	1–4	1–4	1–4
<i>M</i>	3.19	2.98	3.03	2.83	2.81	2.25
<i>SD</i>	0.71	0.61	0.71	0.81	0.72	0.56

Note. Cronbach's alpha values are on a diagonal. * $p < .05$. ** $p < .01$ (two-tailed).

^aNo correlation.

^bLow correlation.

^cModerate correlation.

^dModerately high correlation (Zhu, 2012).

Table 3. Descriptive statistics for maturity status by grade and sex.

Grade	Girls		Boys	
	N	M (SD)	N	M (SD)
5	18	2.01 (0.45)	12	1.72 (0.55)
6	59	2.22 (0.54)	38	2.04 (0.46)
7	25	2.59 (0.60)	24	2.38 (0.46)
8	35	2.65 (0.47)	30	2.61 (0.49)

In girls, there were moderate to moderately high positive correlations among all physical self-perceptions and no or low negative correlations between maturity status and physical self-perceptions. There were also moderate to moderately high positive correlations among physical self-perception variables for boys; however, only strength had a low positive correlation with maturity status (see Zhu, 2012). Results of the MANOVA were nonsignificant, $F(5, 235) = 0.88$, $p = .49$, Wilk's $\lambda = .98$, partial $\eta^2 = .02$, indicating no gender differences in study variables.

Regression analyses predicting PSW

Neither age nor BMI were significant covariates when entered in Step 1 with the independent variables, so both were removed from the regression analyses. The regression analysis predicting PSW in girls was statistically significant in Step 1, $F(5, 131) = 73.44$, $p < .001$, $R^2 = .74$, with perceived sport competence, conditioning, and attractiveness all significant positive predictors of PSW. In Step 2, the interaction terms explained a little extra variance, which was statistically significant ($\Delta F = 3.42$, $p = .01$, $\Delta R^2 = .03$), with the interaction between maturity status and body attractiveness significantly predicting PSW in girls.

In boys, the Step 1 analysis was statistically significant, $F(5, 98) = 46.52$, $p < .001$, $R^2 = .70$, with perceived attractiveness and strength significantly and positively predicting PSW. In Step 2, the interaction terms explained a little extra variance that was statistically significant ($\Delta F = 3.16$, $p = .02$, $\Delta R^2 = .04$), with the interaction between maturity status and perceived strength significantly predicting PSW in boys. Table 4 displays the beta coefficients for individual predictor variables, and Figures 1 and 2 illustrate the interaction effects for girls and boys, respectively.

Discussion

In this study, we extended Cumming and colleagues' (2011, 2012) research using the biocultural model of maturity-associated variation in physical activity by testing the moderating role of specific physical self-perceptions in the relationship between maturity status

Table 4. Results of hierarchical regression analyses predicting physical self-worth.

	Girls		Boys	
	β	t	β	t
Step 1				
Sport competence	.38	5.63**	.14	1.77
Conditioning	.16	2.55*	.17	1.75
Attractiveness	.46	8.64**	.47	5.59**
Strength	.05	0.83	.20	2.86**
Maturity	.04	0.74	.08	1.39
Step 2				
Sport competence	.36	5.35**	.16	1.93
Conditioning	.16	2.47*	.12	1.22
Attractiveness	.44	8.50**	.42	5.17**
Strength	.07	1.20	.25	3.56**
Maturity	.02	0.41	.12	1.98
Maturity \times Sport Competence	.01	0.07	-.01	-0.13
Maturity \times Conditioning	-.10	-1.44	-.13	-1.32
Maturity \times Attractiveness	.17	2.80**	-.11	-1.30
Maturity \times Strength	-.09	-1.26	.20	2.87**

* $p < .05$. ** $p < .01$.

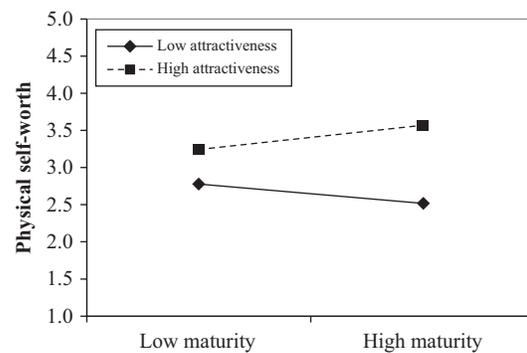


Figure 1. Graphed interaction of maturity status and perceived attractiveness predicting physical self-worth in girls. Values for high and low maturity status and attractiveness are one standard deviation above and below the girls' mean. The slope for high perceived attractiveness was statistically significant ($t = 2.66$, $p = .01$), but the slope for low perceived attractiveness was not ($t = -1.85$, $p = .07$).

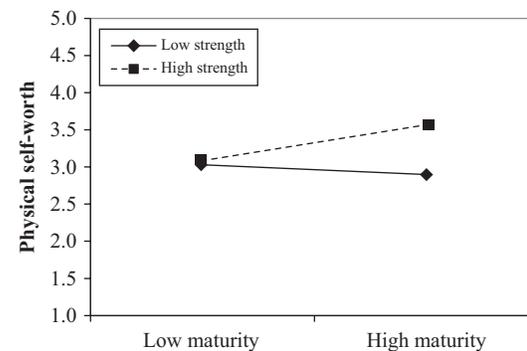


Figure 2. Graphed interaction of maturity and perceived strength predicting physical self-worth in boys. Values for high and low maturity status and perceived strength are one standard deviation above and below the boys' mean. The slope for high perceived strength was statistically significant ($t = 3.84$, $p < .001$), but the slope for low perceived strength was not ($t = -0.94$, $p = .35$).

and PSW in both girls and boys and found partial support for our hypotheses. Contrary to expectations, there was no main effect of maturity status on PSW in girls (though the bivariate correlation was significant) or boys. These findings counter previous research on physical self-perceptions with girls (Cumming et al., 2011) and boys (Fairclough & Ridgers, 2010) but align with research showing no relationship between maturity status and physical activity behavior in girls (Cumming et al., 2014). Consistent with hypotheses, the effect of maturity status on PSW depended on levels of specific physical self-perceptions both for girls and boys.

In girls, maturity status had a positive relationship with PSW under conditions of higher perceived body attractiveness and no significant relationship with PSW when perceived attractiveness was lower. First, these findings indicate that despite previous research showing a negative relationship between maturity status and body attractiveness (Cumming et al., 2011), not all girls feel less attractive as they mature. Second, this significant interaction paints a more hopeful picture of girls' experiences during puberty. It indicates that some girls have higher perceptions of body attractiveness during later stages of physical maturation, and this combination serves to support PSW, which could, in turn, support physical activity behaviors (Lindwall, Ascii, & Crocker, 2014). It is important to note that though there was support for the moderating role of body attractiveness, the main effects of perceived sport competence and conditioning explained substantial variance in PSW and therefore support previous research (Hagger, Biddle, & Wang, 2005).

In boys, though perceived strength and attractiveness positively predicted PSW, supporting previous research (Hagger et al., 2005), the main effect of strength was overridden by an interaction with maturity status. This interaction indicated that maturity status had a positive relationship with PSW, but only in boys who also held higher perceptions of physical strength. In boys with lower perceived strength, maturity status did not relate to PSW. Therefore, similar to girls, the effect of puberty on PSW in boys depends on how they feel about their physical attributes (i.e., strength) as they mature. Though many boys experience relative gains in muscle mass during adolescence (Malina et al., 2004), this change is not universal and it is their perceptions of strength that determine how maturation will impact their overall PSW. The significant interaction effects in both boys and girls supports Cumming and colleagues' (2012) contentions that different variables may moderate the effects of maturation on physical activity behavior. Here, we have provided some evidence that specific physical self-perceptions may moderate the

relationship between maturity status and PSW in boys and girls. In turn, PSW is known to predict physical activity behavior (Raudsepp et al., 2002). Though the additional variance explained by the interactions is small, the graphs illustrate the meaningful difference (i.e., half a point to a whole point on a 5-point scale) in PSW between youth, with higher and lower physical self-perceptions at the higher levels of maturity status. We encourage researchers to test the potential moderating roles of physical self-perceptions in the relationship between maturity status and physical activity directly as well as other health behaviors (e.g., maintaining a healthy diet or sexual risk taking).

The differential roles of perceived body attractiveness in girls and perceived strength in boys align with existing research and theory regarding gender norms and physical activity for developing girls and boys (Messner, 2000). It is important to note that though our findings suggest that increased feelings of attractiveness/strength can be adaptive in terms of girls' and boys' feelings of PSW (and by extension, their levels of physical activity), abiding by traditional gender roles may restrict the type of physical activities in which girls and boys choose to participate. Given the widely accepted notion that sport is a reflection of society (see Coakley, 2014), different sports and physical activities can be generally classified as either masculine or feminine (Koivula, 2001). Thus, more mature girls who perceive themselves as attractive and boys who perceive themselves as more physically strong may feel pressure to participate only in those sports and activities that align with traditional gender norms and may limit themselves from participating in gender-neutral or gender-nonconforming activities. Future research is needed to examine the extent to which physical self-perceptions can serve to overcome these gendered barriers.

Our findings also have interesting implications for individuals who work with youth and have the ability to influence the physical activity experiences of adolescents. Research on positive youth development (PYD; Holt, 2008) suggests that the benefits of physical activity can be met only when participation is structured intentionally with specific emphasis on developing the strengths and assets of youth, as opposed to focusing on their deficits. Grounding the results from this study in the PYD philosophy suggests that coaches and others involved in physical activity programs may be able to help youth navigate puberty by helping them to view the physical changes associated with maturity constructively. For example, with girls, this means having confidence in their physical attractiveness as they experience pubertal changes; however, it is necessary that physical activity programs and coaches work to promote broad definitions of physical attractiveness while discounting narrow

definitions (e.g., the “thin” ideal) so that all girls can feel confident in their appearance.

The diversity of experiences that girls and boys have in relation to their physical maturation indicates that while some adolescents struggle with their PSW during this period of development, others thrive and may even improve their overall PSW. The role that their physical self-perceptions play in their experiences of PSW should be taken into consideration as boys and girls mature. These findings open the door to identifying strategies that will help both girls and boys successfully navigate these challenging developmental changes while promoting positive feelings of PSW and physical activity behaviors.

What does this article add?

This study adds to the literature on the biocultural model of maturity-associated variation in physical activity (Cumming et al., 2012) by testing specific physical self-perceptions as moderators rather than mediators of the relationship between maturity status and PSW. It also extends the body of work on the relationships among maturity status, specific physical self-perceptions, and PSW using this model with girls to a sample of boys. The key message from the results of this study is that the meaning and impact of maturity experiences are not universal and depend on individual interpretation for both girls and boys.

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