Strengthening the relationship between physical activity and physical self-concept: The moderating effect of controllable attributions

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Individuals' perceptions of themselves are known as their self-concept. The self-concept has been proposed to encompass multiple dimensions of life domains, such as the social self, emotional self, and physical self (Shavelson, Hubner, & Stanton, 1976). Physical self-concept includes perceptions of appearance, fitness, and abilities. Physical self-perceptions are arguably the strongest predictors of a range of mental health outcomes associated with well-being, including depression and anxiety (Steiger, Allemand, & Robins, 2014), and emotions of shame and guilt (Crocker et al., 2014). While research on physical self-concept often focuses on children and adolescents, physical self-concept has been acknowledged to be an important construct to individuals across the lifespan from many different backgrounds (Marsh, Martin, & Jackson, 2010). Therefore, understanding the physical self-concept can be an effective strategy to help improve well-being in a diverse range of the population and, as such, it is important to understand potential antecedents and moderators that can be utilized to help improve individuals' physical self-concept.

Increasing physical activity may be an effective strategy to improve physical self-concept (Babic et al., 2014; Crocker, Eklund, & Kowalski, 2000). In their review of correlates of physical self-concept, Babic and colleagues reports a moderate effect for the association between physical activity and physical self-concept. Marsh and colleagues describe a reciprocal effects model, whereby the relationship between physical activity and physical self-concept is bi-directional (Marsh, Papaioannou, & Theodorakis, 2006). Furthermore, Babic and colleagues concluded a systematic review with the premise that the physical activity and physical self-concept relationship is likely bi-directional. Nonetheless, recent longitudinal research findings on

children and adolescents have supported a consistent causal relationship between physical activity and physical self-concept, whereby increased levels of physical activity improved physical self-concept several weeks and months later (Garn et al., 2019, 2020). This directional relationship is described theoretically as a skill development hypothesis and is foundational to the current study whereby physical self-concept is impacted by changes in physical activity behavior.

This relationship may be affected by achievement motives for being physically active. For example, Frederick and Morrison (1996) found that individuals often increase physical activity with the goal of improving physical fitness. Consistent with this assertion, a physical activity intervention only improved physical self-concept when physical fitness was also improved (Schneider, Dunton, & Cooper, 2008). Engaging in physical activity for the purpose of enhancing fitness is likely to encourage achievement-focused outcomes; controllable attributions for these outcomes may be integral to strengthen the relationship between physical activity and physical self-concept.

Controllability is the extent to which individuals personally believe they have control or no control over the cause of an event (Weiner, 1985). Controllability is considered an attribution, which is generally an individual's explanation for why certain events occurred (Weiner, 1985). Other common attribution dimensions include internality (i.e., belief that the cause of an event is due to factors relating to the individual or factors relating to the environment) and stability (i.e., the belief that the cause of an event will remain stable or change over time). The extent to which individuals' attributions lie along these dimensions of controllability, internality, and stability is believed to have a strong impact on emotional experiences (Tracy & Robins, 2004). Tracy and Robins theorize that internal, controllable, and stable attributions for positive events pertinent to

oneself (i.e., goal achievement) often lead to emotions of authentic pride, while external, uncontrollable, and unstable attributions for negative events pertinent to oneself (i.e., goal failure) typically lead to emotions of shame. As such, attributions can trigger emotional responses that are important for physical and mental health. Of these three dimensions, attribution theory in physical activity (e.g., Rees et al., 2005) purports that perceptions of controllability are the primary predictor of future outcomes.

In physical activity contexts, controllable attributions are considered to be adaptive and lead to outcomes such as increased self-confidence to perform well (Rees, 2007). Simply put, if the cause for a negative event (e.g., goal failure) is perceived to be controllable, individuals believe they can enact the changes necessary to change the outcome in the future. Similarly, if the cause of a positive event (e.g., goal achievement) is perceived as controllable, individuals believe that they can orchestrate events to maximize the likelihood of a similar outcome in the future. In an academic context, researchers have observed that attributions to effort, which are typically perceived to be controllable, are an effective strategy to improve academic self-concept (Craven, Marsh, & Debus, 1991). Further, controllable attributions for situations that typically cause the failure-specific emotion of shame have been positively related to higher levels of physical self-concept (Crocker et al., 2014). Based on this latter study, individuals who develop controllable attributions for situations that cause shame (e.g., unable to achieve fitness goals) are more likely to report higher perceptions of physical self-concept compared to those who do not believe they can control causes for achieving their fitness goals. In the current study, we test controllability attributions as a mechanism strengthening the association between physical activity and physical self-concept.

While controllable attributions can likely facilitate positive perceptions of the physical self, it is also conceivable that controllable attributions can enhance the effects of physical activity on physical self-concept. For example, controllable attributions have been reported to strengthen the association between perceived success and expected success in a study examining exercise success expectations in cancer survivors (Courneya et al., 2004). That is, individuals who perceived their exercise program to be successful reported higher expectations of future success when they attributed their success to controllable causes. Further, individuals reported lower levels of negative affect only when they perceived their exercise program as a success and attributed their success to controllable causes. This research highlights that controllable attributions can influence the effect that physical activity can have on cognitive and emotional outcomes. As such, when examining the relationship between physical activity and one's perceptions of physical self-concept, the moderating effect of controllable attributions may be observed in scenarios evoking achievement (i.e., pride) and failure (i.e., shame) emotions. If, for example, individuals experience pride after achieving their fitness goals, and this achievement is attributed to something that is controllable (e.g., proper time management), then the increased physical activity might be more likely to facilitate positive changes in physical self-concept. On the contrary, if individuals experience pride, but believe the achievement is attributed to something that is less controllable (e.g., specific fitness instructor), then physical activity may not be as strongly related to physical self-concept. Similar trends may be expected from experiences of shame tied to fitness goal failure, with physical activity remaining associated with physical self-concept when one believes they can control the causes for the failure and as such enact the changes necessary to be successful moving forward. In summary, physical activity might bring about changes in the physical self-concept when individuals believe they are in

control of the causes for experiencing pride or shame as a result of achieving or failing to achieve their fitness goals.

The purpose of this study was to examine the extent to which controllable attributions for situations that elicit emotional responses (i.e., fitness goal achievement and fitness goal failure) moderates the relationship between physical activity and physical self-concept. First, we hypothesized that there would be a positive association between physical activity and physical self-concept. Second, we hypothesized that, after both fitness goal achievement and fitness goal failure, there would be a positive association between controllability and physical self-concept. Finally, we predicted that there would be an interaction between physical activity and controllable attributions for fitness goal achievement and fitness goal failure on physical self-concept. Specifically, it was hypothesized that there would a stronger relationship between physical activity and physical self-concept for individuals who reported higher controllable attributions for achieving, and failing to achieve, their fitness goals. We expected a weaker association between physical activity and physical self-concept when individuals reported lower controllable attributions for fitness goal achievement and fitness goal failure.

Method

Participants

A convenience sample of 189 individuals (n_{male} = 76, n_{female} = 112, $n_{unspecified}$ = 1) attending universities in [*location removed*] participated in the study. Participants were recruited from classes and participants' age ranged from 18 to 64 years with a mean of 23.8 years (*SD* = 6.3). Of the 189 participants who agreed to participate in the study, 5 failed to complete one or more of the questionnaires and were therefore excluded from the analysis. One individual was also excluded for circling the same response across all questions. This left a sample of 183

participants 74 males, 108 females, and 1 unspecified (*n* = 103 White/Caucasian, *n* = 37 Chinese, *n* = 19 First nation, *n* = 9 South Asian, *n* = 6 Black, *n* = 3 West Asian/Middle East, *n* = 2 Filipino, *n* = 1 Latino, *n* = 1 Korean, *n* = 1 Metis, *n* = 1 other). Of the 183 participants, 29 reported engaging in 30 minutes or more moderate to vigorous physical activity (MVPA) less than two days a week, 95 reported engaging in 30 minutes or more MVPA 2 to 4 days per week, and 55 participants reported engaging in 30 minutes or more MVPA 5 to 7 days per week. Participants mean average BMI was 23.8 (*SD* = 4.5).

Procedure

A university research ethics board granted ethical approval, and all participants provided written consent before participating in the study. Participants were asked to read and imagine themselves in two different scenarios that were presented in a counter-balanced order. One scenario depicted a situation in which individuals were likely to elicit feelings of shame tied to a failure to achieve fitness goals (i.e, goal failure scenario). The other depicted a scenario in which individuals were likely to elicit feelings of pride tied to achievement of fitness goals (i.e., goal achievement scenario). Scenarios were consistent with methodology commonly used in attribution research (Crocker et al., 2014; Murray, Coffee, Eklund, & Arthur, 2019; Shapcott & Carron, 2010) and were informed by information derived from a pilot study in which adults were invited to provide a narrative of their physical activity experiences that elicit self-conscious emotions. These descriptions were then analyzed for common themes using inductive content analysis and used to inform the emotion eliciting scenarios. This protocol was similar to the protocol used by Crocker and colleagues (2014) in their study of attributions and physical self-concept. The goal failure scenario stated:

"During your recent exercise sessions, you experience a lot of difficulty, are exhausted and unmotivated, and find it to be very strenuous. Regardless of your recent attempt to get back into shape, you are always out of breath, and just simply out of shape."

The goal achievement scenario read…

"You would like to improve your fitness and get in shape for a race that is coming up in 3 months. You have never raced but you have thought about it frequently over the past year. You decide to participate in kick boxing lessons twice a week and train at the gym 2 additional days in order to try and build up your cardiovascular fitness. Three months later, you sign up for the race and complete it in an excellent time."

All participants read either the goal failure scenario or goal achievement scenario before completing measures assessing their attributions to the scenario, and questions assessing the relevance of the scenario to themselves. Participants then read the other scenario and again were asked to complete measures assessing their attributions and relevance. Once both scenarios and questionnaires were completed, participants were asked to complete measures assessing their physical activity levels and their physical self-concept. Finally, participants completed demographic items once all measures were complete.

Measures

Manipulation check

Upon reading the scenarios, two questions were used to assess the extent to which participants believed the situation was relevant to them: "How likely is this type of situation to happen to you?" and "Were you able to see yourself in this situation?" To ensure all participants, at a minimum, understood the situation and could imagine what it was like to be in the scenario,

response options were not at all (1), a little bit (2), somewhat (3), a lot (4), and extremely (5); participants who responded not at all to at least one of the questions were excluded from the analyses. This approach was adopted by previous hypothetical scenario based attribution studies (Gilchrist, Solomon-Krakus, Pila, Crocker, & Sabiston, 2020).

Attributions

Controllability was assessed using the Controllability, Stability, Globality, and Universality questionnaire (CSGU: Coffee & Rees, 2008b). After reading each scenario detailed above, participants were asked what they believe to be the main cause of the scenario. After providing a cause, participants were asked "In general, to what extent is your reason something that…". Four items were then used to assess the extent to which they believe the cause is controllable (e.g., you could exert control over in the future). Participants responded on a five-point scale from 1 (*not at all*) to 5 (*completely*). The CSGU has demonstrated strong reliability and validity (Coffee & Rees, 2008). Cronbach's alpha for the controllability subscale was .86 for the goal achievement scenario and .91 for the goal failure scenario.

Physical Activity

Physical activity was operationalized as moderate to vigorous physical activity (MVPA) during a typical week and in the past week (Prochaska, Sallis, & Long, 2001; Sabiston & Crocker, 2008). Participants were asked: "Over a typical or usual week, on how many days are you physically active for a total of at least 30 minutes per day?" and "Over the past 7 days, on how many days were you physically active for a total of at least 30 minutes per day?" Items were rated on a scale from 0 days to 7 days.

Physical self-concept

The physical self-concept subscale within the Physical Self-Description Questionnaire (PDSQ; Marsh, Richards, Johnson, Roche, & Tremayne, 1994) was used to assess physical self-concept. The physical self-concept subscale consists of six items aimed at measuring how individuals feel about themselves physically (e.g., I feel good about who I am physically). Participants responded on a 6-point rating scale from 1 (*false*) to 6 (*true*). The PDSQ has been observed to have strong reliability and validity (Marsh, 1996), and has been used to measure physical self-concept on individuals in a wide age range from diverse backgrounds (Marsh et al., 2010). Cronbach's alpha in the current study was .97.

Self-conscious emotions

Self-conscious emotions of shame and pride were measured as a check to ensure scenarios elicited the expected emotions.

Shame. Participants were asked to report the extent to which they believed they would experience five emotions encompassing feelings of shame (i.e., mortified, disgraced, mad at self, ashamed, humiliated) in response to each hypothetical scenario described above. Items were rated on a 5-point Likert scale from (1) *not at all* to (5) *extremely*.

Pride. Pride was measured by asking participants to report the extent to which they believed they would experience five emotions encompassing pride (i.e., successful, confident, accomplished, achieving, proud) in response to each hypothetical scenario described above. Items were rated on a 5-point Likert scale from (1) *not at all* to (5) *extremely*.

Demographics

Demographic variables including age, gender, height, and weight were self-reported. Height (meters) and weight (kilograms) were used to calculate body mass index (BMI).

Data Analysis

R version 4.0.0 (R Core Team, 2020) was used for all analyses. Assumptions pertinent to hierarchical linear regression analyses were examined prior to analysis. Independent samples t-tests were used to examine differences between participants retained and excluded from the analysis. As preliminary descriptive information, independent samples t-tests were used to explore differences between males and females on all study variables. All predictor variables were grand mean centered prior to regression analyses. Hierarchical linear regression models were used to analyze the main and interactive effects of physical activity and controllability on physical self-concept.

Hierarchical linear models were built across four steps. First, we controlled for gender and BMI because males and individuals who are a healthy weight typically report higher levels of physical self-concept compared to females and overweight individuals (Binkley, Fry, & Brown, 2009; Klomsten, Skaalvik, & Espnes, 2004). We also controlled for age, as researchers have observed that individuals' self-concept typically improves as they age (Diehl & Hay, 2011). Finally, we controlled for the specific self-conscious emotion that was relevant to the scenario. Therefore, for the goal achievement scenario, at Step 1, participants' gender, BMI, age, and levels of pride were first included as covariates in the model. At Step 2, physical activity was entered as a predictor variable. Perceptions of controllability pertinent to the scenario was entered at Step 3, and the interaction between physical activity and controllability was added in Step 4. Significant interactions in Step 4 were followed up by examining simple slopes. Simple slopes analyses were conducted using the simple_slopes function in the reghelper package of R. Analyses of the goal failure scenario followed the same steps, with levels of shame replacing levels of pride as a covariate. All regressions were run using the lm function in the stats package

in R. In accordance with Hayes (2017), 95% bootstrap confidence intervals with 10,000 replications were calculated using the boot.ci function in the boot package in R.

Results

There were no violations to the assumptions for regression analysis, and data were normally distributed. Means, standard deviations and bivariate correlations for all study variables are presented in Table 1. There were no significant gender differences in any study variables. Furthermore, there were no significant differences in attributions between the goal failure and goal achievement scenarios, $t(179) = 1.43$, $p = .15$ $d = .10$, suggesting that participants reported similar controllability attributions in both scenarios. As expected, individuals reported higher levels of shame in response to the goal failure scenario ($M = 2.1$, $SD = 1.0$), compared to the goal achievement scenario ($M = 1.3$, $SD = 0.6$), $t(179) = 10.7$, $p < .01$, $d = .79$; and higher levels of pride in response to the goal achievement scenario ($M = 4.2$, $SD = 0.8$), compared to the goal failure scenario ($M = 1.5$, $SD = 0.7$), $t(179) = 30.8$, $p < .01$, $d = -2.3$. Of the 183 eligible participants, 22 participants responded 'not at all' to one of the manipulation check items and thus failed the manipulation check for the goal achievement scenario and 35 participants failed the manipulation check for the goal failure scenario. These participants were removed from their respective analyses, which left a final sample of 161 for the goal achievement scenario, and 148 for the goal failure scenario (Figure 1). Sample size calculations revealed a sample of at least 130 individuals would be sufficient to detect a small effect size of .10, with five parameters, power set to .80 and at a significance threshold of .05. Participants removed from the goal achievement scenario analysis reported significantly lower physical self-concept, $t(23.52) = 2.45$, $p = .02$, $d = .67$, and less physical activity, $t(29.82) = 4.60$, $p < .01$, $d = .88$, compared to those who were retained for the analysis. Participants removed from the goal failure scenario analysis reported

significantly higher physical self-concept compared to those who were retained for the analysis $t(54.57) = 5.80$, $p < .01$, $d = .97$. There were no other significant differences in any study variables between participants removed and participants retained in the analyses.

Hierarchical regression models

Results for linear regression models examining the association between physical activity, controllable attributions, and physical self-concept are detailed in Table 2.

Goal achievement scenario

Analysis of covariates at Step 1 revealed no significant association between gender and physical self-concept, $b = .27$, $p = .13$, or between age and physical self-concept, $b = -.004$, $p = .78$. There was a significant negative association between BMI and physical self-concept, $b = -.07$, $p < .01$, but no association between pride and physical self-concept, $b = .08$, $p = .45$. Covariates explained 7% of the variance in reported physical self-concept, multiple $R^2 = .07$. Inclusion of physical activity in the model at Step 2 revealed a significant positive association between physical activity and physical self-concept, $b = .21$, $p < .01$, multiple $R^2 = .15$, 95% CI [.10, .29], indicating that more physically active participants had a higher physical self-concept compared to less physically active participants. At Step 3, controllable attributions were not significantly associated with physical self-concept, $b = .19$, $p = .11$, multiple $R^2 = .19$, 95% CI [-.06, .43]. At Step 4, the interaction term between physical activity and controllability on physical self-concept was significant, $b = .14$, $p = .03$, multiple $R^2 = .22$, 95% CI [.04, .25]. Analysis of simple slopes revealed no significant relationship between physical activity and physical self-concept at lower levels of controllability, $b = .09$, $p = .15$; at higher levels of controllability, however, a strong positive relationship between physical activity and physical self-concept was observed, $b = .30$, $p < .01$ (Figure 2).

Goal failure scenario

At Step 1, gender, $b = .16$, $p = .28$ and age, $b = -.01$, $p = .75$, were not significantly related to physical self-concept. BMI was significantly negatively associated with physical self-concept, $b = -.08$, $p < .01$, and shame was significantly associated with physical self-concept, $b = -.26$, $p < .01$. Covariates explained 8% of the variance in physical self-concept, multiple $R^2 = .16$. Physical activity was again significantly associated with physical self-concept, $b = .20$, $p < .01$, multiple $R^2 = .25$, 95% CI [.08, .29]. At Steps 1 and 2 differences between the goal achievement and goal failure scenarios can be attributed slight differences in the sample (i.e., different individuals who passed and failed the manipulation checks). At Step 3, controllable attributions were not significantly associated with physical self-concept, $b = .05$, $p = .59$, multiple $R^2 = .25$, 95% CI [-.11, .22]. At Step 4, the interaction term between physical activity and controllability on physical self-concept was not significant, $b = .08$, $p = .10$, multiple $R^2 = .27$, 95% CI [-.004, .16].

Discussion

The purpose of this study was to examine the extent to which controllable attributions for hypothetical goal achievement and goal failure scenarios moderated the relationship between physical activity and physical self-concept. Individuals who were more physically active reported higher physical self-concept compared to those who were less physically active. Although controllable attributions were not associated with levels of physical self-concept, after goal achievement controllable attributions moderated the relationship such that the association between physical activity and physical self-concept was only observed at higher levels of controllability. No significant interaction was observed after goal failure.

These results indicate that attribution theory (Rees, Ingledew, & Hardy, 2005) can be applied to promote a better understanding of the effects of physical activity participation in adults. Specifically, these results provide evidence that after achieving fitness goals, controllable attributions might strengthen the relationship between physical activity and physical self-concept. Attribution theory suggests that individuals with stronger perceptions of controllability feel a greater sense of responsibility (Den Boer, Kok, Hospers, Gerards, & Strecher, 1991). As such, these feelings of responsibility likely lead individuals to feel like the success is related to the self, in turn strengthening the relationship between physical activity and perceptions of the physical self. The null finding after goal failure indicates that individuals might need to experience some level of achievement for controllability to moderate the relationship between physical activity and physical self-concept.

The results of the current study could be used to inform attributional retraining practices. Attributional retraining involves applied interventions aimed at encouraging individuals to adopt controllable attributions (Perry, Chipperfield, Hladkyj, Pekrun, & Hamm, 2014). For example, in an academic setting, students who are encouraged to adopt controllable attributions for receiving a poor grade go on to improve their academic performance compared to those who are not encouraged to adopt controllable attributions (Parker, Perry, Hamm, Chipperfield, & Hladkyj, 2016). Taking into account the results of the current study, these attributional retraining practices could be combined with physical activity interventions to help improve individuals' physical self-concept. That is, instead of interventions solely focusing on getting individuals active, it is important that interventions are also focused on encouraging individuals to adopt controllable attributions during the physical activity programs. For example, if individuals set clear measurable fitness related goals, attribution retraining that follows Perry and colleagues'

protocols (Perry et al., 2014; Perry & Penner, 1990) could be implemented within a physical activity intervention. That is, individuals are encouraged to initiate a causal search for the reason why they achieved or failed to achieve their fitness goals, then encouraged to develop controllable attributions for this reason, followed by procedures to consolidate the attribution (e.g., group discussion, essay writing etc.). Further research is needed to determine whether this attribution retraining protocol may enhance the effectiveness of a physical activity intervention on physical self-concept.

Only the interaction between physical activity and controllability after the goal achievement scenario was statistically significant. Typically, failure is more likely to induce a causal search (i.e., understand the reasons behind the outcome) compared to success (Weiner, 1985). The results of the current study, however, suggest that engaging in a causal search after achieving fitness goals may be also be beneficial, further emphasizing the importance of including attribution retraining into physical activity interventions.

The finding that attributions are not directly associated with physical self-concept was surprising. Research in sport has found that athletes who typically attribute events to controllable causes (i.e., have a controllable attributional style) will be more confident in themselves and their performances (Martin-Krumm, Sarrazin, Peterson, & Famose, 2003). The hypothetical scenario in the current study, however, may weaken the association between attributions and physical self-concept. Although participants who could not envision themselves in the situation were removed from analysis, it may be that attributions must be relevant to individuals' current situations to be directly related to physical self-concept. To enhance ecological validity, the scenarios were developed based on experiences that elicit strong self-conscious emotions, and researchers have observed consistent findings between scenario based attribution research and

behavioural experiments (Coffee, Rees, & Haslam, 2009; Murray et al., 2019), however, it is important to note that even the most well designed scenarios likely lack ecological validity (Hughes & Huby, 2002). As such, caution must be used when generalizing these results to real world situations. Researchers should take steps to address this limitation by exploring the impact of attributions for real life events which elicit feelings of pride and shame.

Another important limitation of the current study is the cross-sectional design which precludes causality. Before these associations are implemented in intervention studies, researchers should examine these associations longitudinally. For example, although we observed null findings after goal failure, over time controllable attributions might encourage individuals to continue physical activity programs, in turn strengthening the association between physical activity and physical self-concept. Further, the current study examined physical self-concept on a global scale. However, physical self-concept is a multidimensional construct represented by different physical self-perception facets (Marsh et al., 2010; e.g., endurance self-perceptions, strength self-perceptions, sport self-perceptions). As such, the relationships observed in this study might also apply at the dimensional level and this should be tested. For example, perceived controllable attributions for strength improvements may strengthen the relationship between resistance training behavior and strength self-perceptions.

Finally, it was notable that participants with higher physical self-concept could not imagine themselves failing to achieve their fitness goal and were thus removed from that analysis. While high levels of physical self-concept is typically perceived to be positive, being able to think of oneself in possible physical activity settings is believed to be an important component in the physical activity process (Ouellette, Hessling, Gibbons, Reis-Bergan, & Gerrard, 2005). Further, the opposite association was observed in the goal achievement

condition, whereby, participants with lower physical self-concept could not imagine themselves achieving fitness related goals and thus were removed from that analysis. These findings indicate that these individuals might not be cognitively ready to undergo a physical activity intervention, as they would be unable to set positive outcome goals, a key component in achieving successful fitness outcomes (Murru & Martin-Ginis, 2010). To address this concern, the hypothetical scenarios used in this study might be adopted as part of a pre-physical activity intervention whereby individuals are encouraged to adopt adaptive (controllable) attributions for hypothetical fitness related scenarios. This in turn might help individuals with lower physical self-concept be more cognitively receptive to future physical activity interventions. In other words, attributional retraining using hypothetical fitness related scenarios might act as an effective pre-physical activity intervention to cognitively prepare individuals for an upcoming physical activity intervention.

In conclusion, this study provided preliminary support for the meaningfulness of attribution theory when examining the relationship between physical activity and physical self-concept. Overall, results indicated the importance of controllable attributions in achievement-oriented tasks, whereby increased levels of physical activity behavior, paired with stronger perceptions of controllability pertinent to this behavior, were associated with better perceptions of the physical self after goal achievement. It is important to note that, according to Marsh et al.'s reciprocal effects model (Marsh et al., 2006) these enhanced self-perceptions may in turn increase physical activity behavior. If these results are confirmed using longitudinal designs, physical activity interventions should consider incorporating attribution retraining within the intervention and/or pre-intervention to facilitate the positive effects of physical activity on physical self-concept.

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Tables

Table 1.

Descriptive statistics and bivariate correlations for study variables (N =183)

Variable	Descriptives			Bivariate correlations						
	M	*SD*	Range	1	2	3	4	5	7	8
1. Age (years)	*23.8*	*6.3*	18 – 64							
2. BMI	*23.8*	*4.6*	16 – 42	.28**						
3. Physical Activity	*3.4*	*1.9*	1 – 6	-.08	-.13					
4. Levels of Shame	*2.1*	*1.0*	1 – 5	.02	.22**	-.05				
5. Levels of Pride	*4.2*	*0.8*	1 – 5	.02	.20*	.05	.10			
6. Control after goal achievement	*3.7*	*0.8*	1 – 5	.04	.14	.11	.01	.33**		
7. Control after goal failure	*3.6*	*1.0*	1 – 5	-.08	.10	.07	.10	.26**	.49**	
8. Physical Self-Concept	*4.0*	*1.2*	0 – 7	-.10	-.26**	.35**	-.30**	-.08	.11	.02

Note. BMI = body mass index (kilograms/meter squared), Levels of shame in response to goal failure scenario, levels of pride in response to goal achievement scenario, * $p < .05$, ** $p < .01$

Table 2.

Associations between physical activity, controllability, interactions and physical self-concept

Goal achievement scenario	*Variable*	*b(se)*	*p-value*	R^2	**Goal failure scenario**	*Variable*	*b(se)*	*p-value*	R^2
	Sex	0.27(.18)	.13			Sex	.16(.19)	.28	
	Age	-.004(.01)	.78			Age	-.01(.01)	.75	
Step 1	BMI	-.07(.02)	.002	.07	Step 1	BMI	-.06(.02)	<.001	.16
	Pride	.08(.11)	.45			Shame	-.26(.09)	.003	
Step 2	PA	.21(.04)	<.001	.15	Step 2	PA	.20(.05)	<.001	.25
Step 3	Controllability	.19(.12)	.11	.19	Step 3	Controllability	.05(.09)	.59	.25
Step 4	PA* Controllability	.14(.06)	.03	.22	Step 4	PA* Controllability	.08(.05)	.10	.27

Note. BMI = body mass index (kilograms/meter squared), PA = physical activity, se = standard error

Figures

Figure 1

Participant drop out flow chart

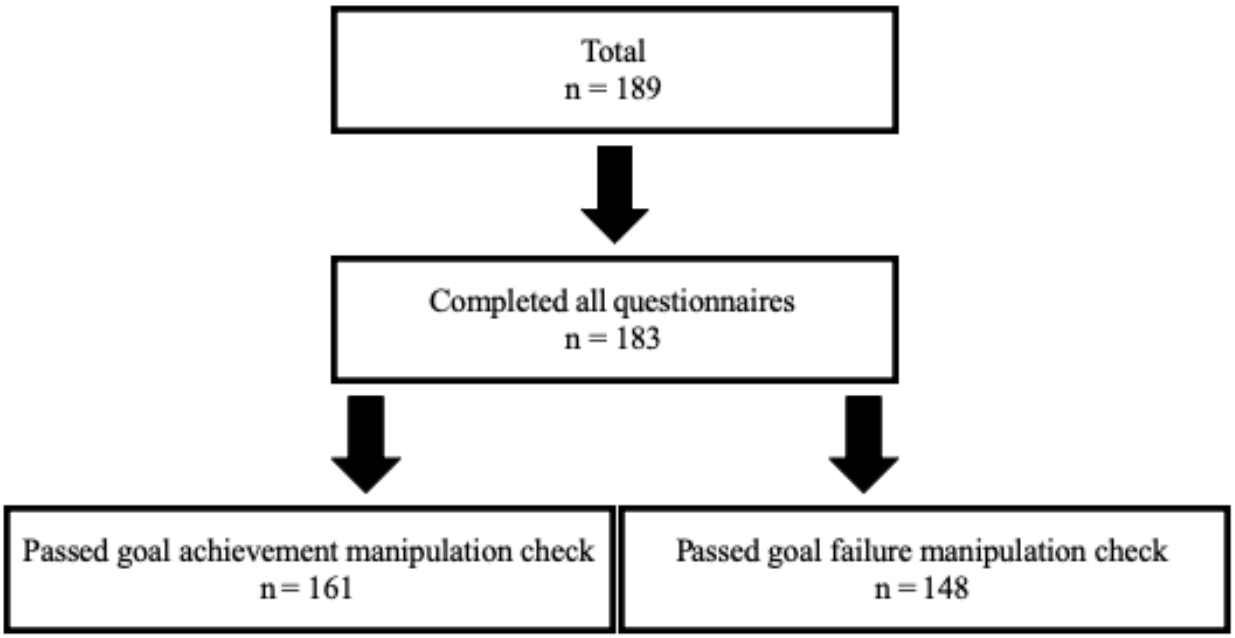
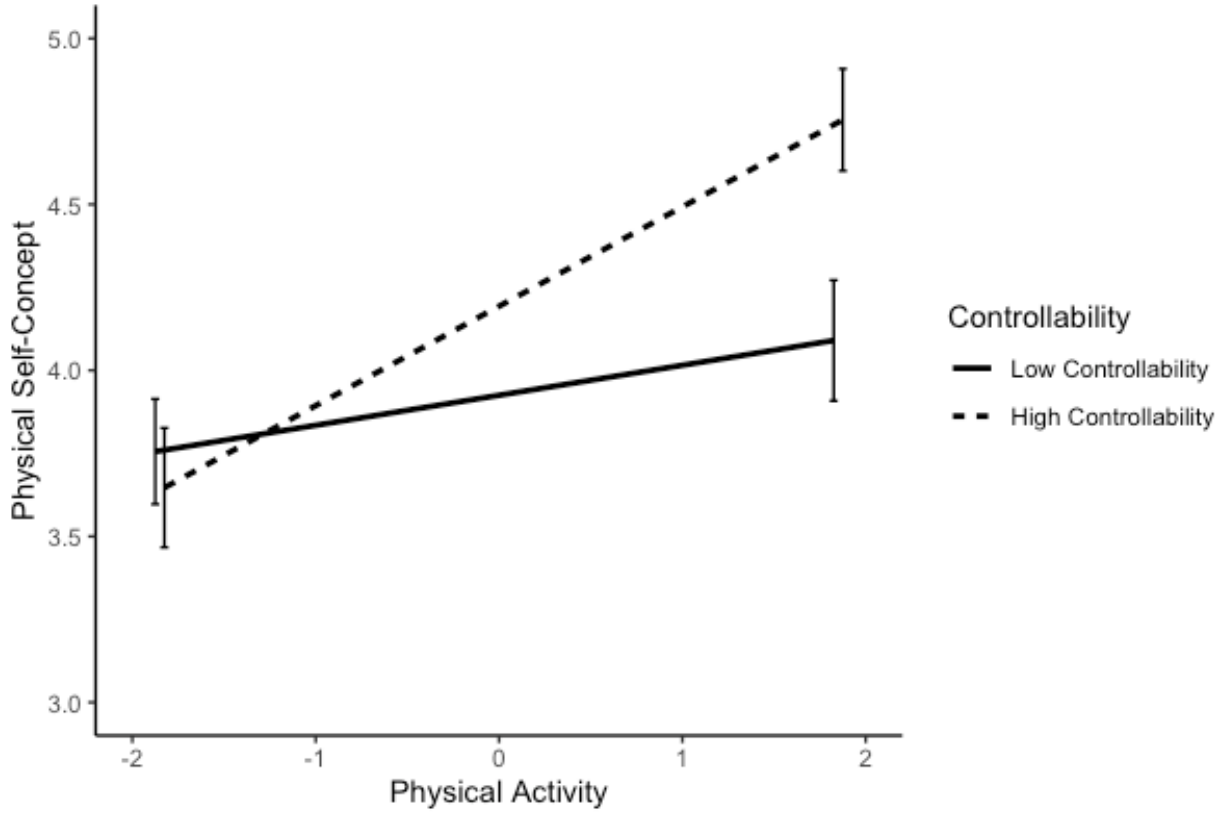


Figure 2

Interaction between physical activity and controllability on physical self-concept after the goal achievement scenario



Note. Predictor variables were mean centered, and controllability was plotted at +1 SD (.76) and -1 SD (-.76). Physical activity was also plotted at +1 SD (1.85) and -1 SD (-1.85). Slopes were significant when controllability was below -2.73 and above -.29.