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Do Physical Self-Efficacy and Physical Self-Concept Mediate the Relationship Between Past Sports Participation, Past Gym Grades and Physical Activity Across the Life-Span?

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Do Physical Self-Efficacy and Physical Self-Concept Mediate the Relationship Between Past Sports Participation, Past Gym Grades and Physical Activity Across the Life-Span?

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ABSTRACT

The previous literature suggests that getting good grades in physical education and being involved in competitive athletics as an adolescent leads to higher levels of physical activity later in life. I devised two studies to test a proposed model in which individuals' self-perceptions (their physical self-efficacy and physical self-concept) serve as a mediating factor between these early life predictors and physical activity levels across the life-span. In Study 1, I examined, in 112 collegiate participants, how participation in childhood and adolescent sports and past gym grades not only influenced current activity levels and current athletic involvement, but also affected students' physical self-efficacy and physical self-concept. Then, I investigated the relationship between those self-perceptions and current physical activity levels. Of the childhood predictors, only past gym grade correlated with current physical activity levels. However, greater involvement in either childhood or high school sports led to higher levels of physical self-efficacy, and higher past gym grades were associated with increased levels of physical self-concept. Additionally, those with more positive physical self-perceptions also reported higher levels of physical activity. In Study 2, I continued investigating the proposed model in 50 older adults. Inconsistent with past studies, neither past sports participation nor past gym grades predicted activity levels in these older adults. However, consistent with my proposed model, older adults who participated in high school sports had more positive self-perceptions, and physical self-perceptions were positively associated with current physical activity levels. Overall, I believe that because an increase in physical self-perceptions positively relates to physical activity levels in adulthood, increasing individuals' physical self-perceptions may be one way to increase their physical activity and overall health in later life.

BACKGROUND

It is common knowledge that good health requires a physically active lifestyle, and it is a physically active lifestyle that leads one to live a healthier and longer life (Barnekow-Bergkvist, Hedberg, Janlert & Jansson, 1996). Yet knowing this, some individuals still do not exercise regularly as adults. Research demonstrates that most people are physically active at a young age, but total physical activity time significantly decreases from age 13 to age 27. After the age of 27, however, a portion of the population begins to resume physical activity (Kemper, 1995). Some researchers believe that during major transitions in one's life, from high school to college then from college to a career, people tend to put their physical activity on hold. However, once all is settled, some resume an active lifestyle (Kemper, 1995). But why do some resume a lifestyle of activity while others do not? Telama, Xiaolin, Laakso & Viikari (1997) believe that the experiences acquired and skills learned during adolescence, lead one back to a lifestyle of physical activity later in life.

Retrospective studies have shown that the formation of habits, both health and activity related, during childhood is vital to carrying those habits into adulthood (Azevedo, Araujo & Hallal, 2007; Barnekow-Bergkvist et al. 1996; Nelson, Gordon-Larsen, Adair, & Popkin, 2005; Telama et al. 1997; Telama, Yang, Viikari, Valimaki, Wanne & Raitakari, 2005). These studies demonstrate that passive participation in an activity is not sufficient; rather organized participation, such as being part of a team, is necessary for continuation of a physical activity later in life. In addition, researchers have found that sound physical and strong academic educations are also important in promoting and sustaining a physically active lifestyle. In general, the education process trains individuals to stick to routines (physical education) and follow through with commitments (academic education) (Barnekow-Bergkvist et al. 1996;

Telama et al. 2005). In a study that simultaneously examined many of these factors, Engstrom (1986) found 15-year-old individuals who (a) participated in a sporting activity for at least four hours a week, (b) were members in a sports club, and (c) achieved high grades in physical education class were more likely to be active at an older age.

Although these studies highlight predictive variables, none of them have attempted to explain why these factors contribute to a physically active lifestyle. Beyond the possibility of the formation of habits (Azevedo et al. 2007; Barnekow-Bergkvist et al. 1996; Nelson et al. 2005; Telama et al. 1997; Telama et al. 2005), other theories take a more global approach with explanations involving self-efficacy (Phongsavan, McLean & Bauman, 2007; Renner, Spivak, Kwon & Schwarzer, 2007; Ryckman, Robbins, Thornton & Cantrell, 1982; Scholz, Sniehotta, Schuz & Oeberst, 2007) and self-concept beliefs (Brewer, Ralte & Linder, 1993; Hale, James & Stambulova, 1999; Ryckman & Hamal, 1993).

Bandura (1977) defined self-efficacy as "individuals' confidence in their ability to successfully perform a particular task" (pg. 287). Using the social cognitive theory, he found that the experience of mastering a task enhances self-efficacy if this mastery is attributed to the actor's own competencies. He sums these ideas of self-efficacy with this: "At the initial level, perceived self-efficacy influences choice of behavioral patterns. Not only can this perceived self-efficacy have direct influence on the choice of activities and settings, but through expectations of eventual success, it can also affect coping efforts after they have been initiated" (pg. 304).

Only a few studies have applied Bandura's concept of self-efficacy to physically related behaviors. Gill (2007) demonstrated that high physical self-efficacy beliefs (positive feelings about one's physical capabilities) lead to increased effort and to better performance on physical

tasks. He also showed that individuals' beliefs about their physical abilities generalize across different types of physical activities. In another study, Ryckman & Hamel (1993) found that athletes higher in physical self-efficacy cited wanting to stay in shape and wanting to get exercise as more important reasons for their sports participation than those lower in perceived physical ability. Those low in perceived physical ability not only did not like being on teams as much as their counterparts, but they were also more fearful of being embarrassed or humiliated if they did get the opportunity to play. Together, these studies suggest that individuals' views of their physical ability, how well they think they perform as physical tasks, may encourage or discourage physical activity. However, neither study directly examined this link.

Another potential contribution to physical activity may be athletic identity or physical self-concept. Brewer et al. (1993) defined athletic identity as the "degree to which an individual identifies with the athlete role" (pg. 237). The individual with strong athletic identity places much importance on involvement in sports. Although many may picture an ideal athlete as being not only physically well built, but also young in age, when individuals report on their own physical and athletic domains, those domains are prevalent across the life-span—they do not simply pertain to their youth (Brewer et al. 1993). Therefore, individuals who see themselves as athletic at one point in their lives, tend to see themselves as athletic across their life-spans (Brewer et al. 1993). Highly related to athletic identity is physical self-concept, the extent to which physicality more generally is an important component of one's self-identity. Several studies have demonstrated that athletes and non-athletes view themselves differently with regards to their physical self-concept (Beary, 2006; Brewer et al. 1993; Ryckman & Hamel, 1993). Beary (2006), for example, showed that physical self-concept predicted women college

students' level of involvement in athletics. However, physical self-concept has not received much attention as a potential predictor of physical activity levels more generally.

In summary, the literature suggests that being involved in competitive athletics during childhood and high school and getting good grades in physical education leads to higher levels of physical activity later in life. See Figure 1a. The current study is designed to examine a model that explains why these relationships occur. Specifically, I wonder whether these relationships are due to the fact that those who meet these criteria have higher physical self-efficacy and a stronger physical self-concept. In this model, these self-perceptions mediate the association between childhood and adolescent variables and adulthood physical activity. See Figure 1b.

STUDY 1

METHOD

Participants

112 current collegiate students from Butler University completed a series of questionnaires measuring physical self-efficacy, physical self-concept, and physical activity levels. Participants, 45 male and 67 female, were aligned within three groups: formal athletes (current members of a competitive sports team recognized by the NCAA, N=44), intramural athletes (members of an intramural team recognized by Butler University who have participated within at least the last school year, N=28), and non-athletes (N=40). On average, participants were 19 years old (M=19.08, sd=2.01), and the majority of participants were white (82%). See Table 1. For the first two groups, confirmation of each participant's group membership was obtained through NCAA athletic and intramural rosters. Participants were classified as non-athletes if they were not members of either of the two previous groups.

I recruited participants through Introductory Psychology courses and via e-mail. I sent e-mails explaining the study and inviting the student to participate to current Butler University

NCAA athletes and Butler University intramural athletes who had participated in a registered intramural activity during the previous year. I recruited non-athletes by visiting Introductory Psychology courses and informing students about the study. I offered all participants a choice of compensation, either extra credit in a psychology course or a monetary dividend of $5.00.

Procedure

Participants completed the study in groups in a campus classroom. After agreeing to participate in the study, each registered for one of several possible testing sessions. Sessions included a mixture of participants from all three groups. After a brief introduction, participants signed a consent form and then completed a packet of several questionnaires. Participants worked at their own pace and were free to leave upon completion of their packets. Sessions lasted approximately 30 minutes. When participants turned in their packets to the testing session administrator, they provided their name and instructors' name for psychology course extra credit or received a cash payment.

Materials

The packet of questionnaires distributed to each participant included the following: *Demographic Questionnaire*—asked participants to indicate their past and current athletic involvement on formalized teams (e.g. basketball, football, swimming, track, baseball, etc (see appendix A).

International Physical Activity Questionnaire—allowed participants to detail the intensity of their weekly physical activities. Participants indicated how many minutes per week they engage in vigorous, moderate or walking physical activities along with how much time they spend sitting on a weekday (Booth-Kewley & Vickers, 2000; see appendix B). However, due to

concerns regarding the validity of participants' responses to this questionnaire, I did not include it in any analyses for this study.

Physical Activity Index—assessed participants' overall physical activity by asking for more specifics with regards to their amount of breathlessness experienced during a workout, what they like to do in their leisure time, on what level they competitively participate in their sporting activities, and what the last grade they earned in their physical education class was (Telama et al. 2005; see appendix C).

Physical Self-Efficacy Scale—gauged participants' self-efficacy with regards to their physical activity. Participants responded on a scale ranging from "strongly agree" to "strongly disagree," to ten statements such as, "I have excellent reflexes," "I can't run fast," "I have a strong grip," and "I have poor muscle tone" (Ryckman et al. 1982; see appendix D).

Physical Self-Concept Scale—gauged participants' personal views as to how important being physically active is to their self-concept. This questionnaire included ten statements such as, "I consider myself a physically active person," "I have many goals related to physical activity," "I spend my time thinking about physical activity more than anything else," and "I feel bad about myself when I do poorly in a physical activity." Participants responded on a scale ranging from "strongly agree" to "strongly disagree" (adapted from the Athletic Identity Measurement Scale (Brewer, 1993); see appendix E).

Hypotheses

1) Consistent with findings from the past literature, past sports participation and past gym grades will predict current physical activity levels and athletic involvement.
2) Past sports participation and past gym grades will affect current physical self-efficacy and physical self-concept.

3) Current physical self-efficacy and physical self-concept will predict current physical activity levels and athletic involvement. The three groups of college students will differ in their physical self-efficacy and physical self-concept, with NCAA athletes being highest on both of these measures, followed by intramural athletes, followed by non-athletes.

RESULTS

Hypothesis 1

I used correlational analysis to examine the relationships between past sports participation, past gym grades, and current physical activity levels. See Table 2. Past participation in childhood ($r = .052$, ns) and high school ($r = .150$, ns) sports did not correlate significantly with current physical activity levels in these college students. However, consistent with past studies, self-reported past gym grades did predict current physical activity levels ($r = .266$, $p < .01$).

Chi-square analyses evaluated the relationships between past sports participation, past gym grades and current athletic involvement. See Table 3. Only a small number of participants reported no involvement in childhood or high school sports. With regards to childhood sports, only one participant, an NCAA athlete, reported not participating in any childhood sports (Chi square ($n=112$) = 1.56, ns). More participants ($n = 6$) reported no high school sports participation: five in the non-athlete group, one intramural athlete, and no NCAA athletes. This represented a significant between group difference (Chi square ($n=112$) = 6.69, $p < .05$). Finally, eight participants reported achieving less than an A in their past gym class: six non-athletes, one intramural athlete, and one NCAA athlete. This difference between the athletic groups neared significance (Chi square ($n=112$) = 5.72, $p = .06$). Together, these comparisons indicate that

high school sports participation and, possibly, past gym grades predict current athletic involvement in college students, consistent with my first hypothesis.

Hypothesis 2

To examine how past sports participation and past gym grades affect current physical self-efficacy and physical self-concept, I again used correlational analyses. The resulting correlations are also summarized in Table 2. I found significant correlations among several measures. Individuals who reported more participation in high school sports demonstrated higher levels of physical self-efficacy ($r = .274$, $p < .05$), but high school sports did not predict physical self-concept. A weak, although still significant relationship also emerged between activity in childhood sports and current physical self-efficacy ($r = .169$, $p < .05$). In contrast, gym grades were not associated with physical self-efficacy. Instead, gym grades shared a significant relationship with physical self-concept ($r = .207$, $p < .05$).

Hypothesis 3

My third hypothesis stated that physical self-perceptions would predict current physical activity and current athletic involvement in my college student sample. I tested the first part of this hypothesis in a series of correlational analyses. When data from the whole sample was included, both physical self-efficacy ($r = .518$, $p < .001$) and physical self-concept ($r = .593$, $p < .001$) significantly correlated with current physical activity levels. Physical self-efficacy and physical self-concept also shared strong positive correlations with each other ($r = .526$, $p < .001$). See Table 4. I then ran separate correlational analyses for each athletic group to see whether these relationships were consistent across groups. These analyses again revealed strong positive correlations for both intramural athletes and non-athletes between their physical self-efficacy and physical self-concept (intramural athletes: $r = .561$, $p < .01$; non-athletes: $r = .510$, $p < .01$).

This was not true for the NCAA athletes (r = .188, ns). The pattern of correlations between physical self-perceptions and physical activity levels also differed across the three groups. For NCAA athletes and for non-athletes, physical self-concept best predicted physical activity levels (r = .449 and r = .642, respectively; both ps < .01). In contrast, intramural athletes' physical activity levels shared the strongest relationship with physical self-efficacy (r = .372; p = .089, ns).

A series of one-way analyses of variance tested the second part of my third hypothesis by comparing formal athletes, intramural athletes and non-athletes on physical self-efficacy and physical self-concept. See Figure 2. Tukey's post hoc tests examined group differences in follow up analyses. As expected, I found significant group differences in both physical self-efficacy ($F(2, 107) = 14.04$, $p < .001$) and physical self concept ($F(2, 109) = 16.92$, $p < .001$). Follow up analyses indicated that only NCAA athletes demonstrated a tendency to identify strongly with the athletic role. They scored significantly higher than both intramural athletes ($p < .001$) and non-athletes ($p < .001$) in physical self-concept. However, participation in any type of athletics was associated with increased levels of physical self-efficacy, with both NCAA ($p < .001$) and intramural athletes ($p < .05$) scoring higher on the physical self-efficacy scale than non-athletes.

STUDY 2

METHOD

Participants

50 participants, 17 male and 33 female, aged 30 years-old or older participated in this study. On average, participants were 65 years of age (M=64.86, sd=15.97). Participants were well educated; 18% had a high school education, 54% had a college degree, and the remaining 28% had earned a master's degree. 96% of the sample was white. Participants were recruited

using Butler University alumni sources (e.g. a news flash in the Alumni Newsletter) and telephone calls or fliers distributed to area senior citizen centers asking for participants. Participants had the choice of receiving a monetary stipend or a ceramic coffee mug upon completion of the testing session to thank them for their time.

Procedure

Participants completed the study in groups either in a campus classroom or at community locations (e.g., a senior citizen center or a local church). Like in Study 1, after a brief introduction, participants were asked to sign a consent form and then were given a packet of five questionnaires. Background information, physical activity levels, physical self-efficacy, and physical self-concept were evaluated using questionnaires equivalent to those used in Study 1. To analyze the data, I ran a series of t-tests to examine how early life predictor variables affect later life activity levels and physical self-perceptions. I also used correlational analyses to examine how physical self-concept and physical self-efficacy relate to the maintenance of a physically active lifestyle.

Hypotheses

1) Being physically active during childhood and adolescence and getting good grades in past gym classes will be associated with higher levels of physical activity in older adults.
2) Past sports participation and past gym grades will be associated with higher physical self-perceptions in older adults.
3) Having high views of physical self-efficacy and holding a strong physical self-concept will correspond with higher levels of physical activity in older adults.

RESULTS

Hypothesis 1

To examine the association between past sports participation and past gym grades with current levels of physical activity, I used a series of t-tests. Older adults who participated in childhood sports (n = 11, M = 9.00, sd = 2.53) and those who did not (n = 20, M = 8.15, sd = 1.98) did not differ significantly from each other in their current physical activity levels ($t(29) < 1$, ns). See Figure 3. Also, no significant difference emerged between those who were active in high school sports (n = 16, M = 7.88, sd = 1.62) and those who were not (n = 18, M = 8.22, sd = 2.29) with regards to their later life physical activity levels ($t(32) < 1$, ns). See Figure 4. Finally, Figure 5 exhibits the non-significant differences between older adult participants who reported earning an A in their last physical education course (n = 21, M = 8.24, sd = 2.07) versus those who earned a grade lower than an A (n = 18, M = 8.61, sd = 2.03) in terms of their current physical activity levels ($t(37) < 1$, ns). Thus, inconsistent with the past literature, neither past sports participation nor past gym grades was associated with current physical activity levels in my older adult sample.

Hypothesis 2

A series of independent samples t-tests indicated that contrary to expectations, neither childhood sports participation (physical self-efficacy: $t(29) < 1$, ns; physical self-concept: $t(30) < 1$, ns) nor past gym grades (physical self-efficacy: $t(40) = 1.44$, ns; physical self-concept: $t(40) < 1$, ns) significantly affected the physical self-perception variables. See Figures 3 and 5. Although participation in high school sports also failed to significantly impact physical self-concept (sports M = 29.41, sd = 6.64; non-sports M = 25.53, sd = 8.16; $t(32) < 1$, ns), consistent with my hypothesis, older adults who participated in high school sports held higher views of their physical self-efficacy (M = 33.94, sd = 5.46) than older adults who were not high school athletes (M = 28.63, sd = 7.54; $t(31) = -2.33$, $p < .05$). See Figure 4.

Hypothesis 3

Consistent with my third hypothesis, correlational analyses revealed that older adults who were high in physical self-efficacy also reported higher current levels of physical activity ($r = .354$, $p < .05$). Although not quite significant, physical self-concept also shared a positive relationship with physical activity levels ($r = .275$, $p = .074$). See Table 5.

DISCUSSION

I designed two studies to evaluate a model in which individuals' self-perceptions serve as a mediating factor between early life athleticism (sports participation and gym grades) and physical activity across the life-span. See Figure 1. More specifically, my model proposed that past sports participation and past gym grades predict current physical activity levels because they influence physical self-perceptions (physical self-efficacy and physical self-concept). These self-perceptions, in turn, determine current physical activity levels and athletic involvement in adulthood. My two studies tested this model at two points in the life-span in groups of college students (Study 1) and older adults (Study 2).

The results of Study 1 revealed no significant relationships between past participation in childhood and high school sports and current physical activity levels in a group of 112 college students. These findings do not support Engstrom's (1986) proposal that encouraging physical activity early in life may build physical activity habits that can then be carried on throughout life. However, consistent with past studies and my proposed model, self-reported past gym grades did predict current physical activity levels in this young adult sample. I next examined whether individuals' past sports participation and gym grades influenced their current physical self-efficacy and physical self-concept. Consistent with my model, college students who reported more participation in high school sports also reported higher levels of physical self-efficacy.

This relationship was not observed in those students who reported greater involvement in childhood sports. Therefore, it appears that while many individuals may participate in childhood sports, it is their participation in high school athletics that leads to increased levels of physical self-efficacy. No relationship emerged between early life sports participation and physical self-concept, but better past grades were associated with higher views of physical self-concept. These positive relationships between early life athleticism and physical self-perceptions support the possibility that self-perceptions mediate the relationship between past and current physical activity levels. Finally, the results of Study 1 also suggest that young adults' physical perceptions may be influential in determining their choices about maintaining a physically active lifestyle and being involved in athletics. I found significant differences in physical self-efficacy and physical self-concept between NCAA athletes, intramural athletes, and non-athletes. These findings coincide with those reported by Gill (2007) and Ryckman & Hamel (1993) and support their contention that higher physical self-efficacy beliefs lead to increased athletic effort and a desire to be active. My results also support Brewer's (1993) findings that involvement in sports is more likely in those who identify more deeply with the athletic role. In my study, students involved in NCAA athletics had a stronger physical self-concept than either intramural or non-athletes. Both NCAA athletes and intramural athletes scored significantly higher than non-athletes in physical self-efficacy. Thus, simply being a member of a sports team, whether it is an NCAA team or an intramural one, was associated with having higher physical self-efficacy. Perhaps more importantly both physical self-efficacy and physical self-concept correlated strongly with current physical activity levels. In fact, these two factors accounted for approximately 25-30 percent of the variance in self-reported physical activity in the current sample of college groups.

Overall, the proposed model linking early life sports participation to later physical activity through physical self-perceptions was supported. Those who participated in more high school sports and achieved higher grades in their last gym class held higher views of their physical self-efficacy and physical self-concept respectively. Additionally, those who viewed their physical abilities positively and valued their athleticism were more physically active and more involved in collegiate sports.

The results of Study 2, based on a sample of 50 older adults, also supported the proposed model. Inconsistent with past studies, neither older adults' participation in childhood or adolescent sports nor their last gym grade appeared to influence current physical activity levels. These results do not support the previous literature that posited that experience and skills gained during childhood directly affect physical activity later in life (Telma et al. 1997). Perhaps this is because, with a mean age of almost 65, it was difficult for my participants to remember a single grade they received almost 50 years prior, ultimately leading to inaccurate reports. Instead of a direct link between childhood and late life physicality my results support the idea of an additional factor mediating this relationship. Specifically, I found that older adults who participated in high school sports also held higher views of their physical self-efficacy than those who were not high school athletes. Additionally, older adults high in physical self-efficacy and, to a lesser extent, physical self-concept reported higher current levels of physical activity. Together these results support the proposed model where an individuals' adolescent sports participation influences their physical self-perceptions that then determine the choices they make to maintain a physically active lifestyle.

In short, these results extended previous findings related to the continuation of physical activity in later life by highlighting the potential mediating factors of physical self-efficacy and

physical self-concept that may explain the relationship between earlier life athleticism and later life physical activity. Overall, as predicted, physical self-efficacy and physical self-concept were found to play pivotal roles in either determining individuals' collegiate physical activity levels (Study 1) or sustaining them from childhood into older adulthood (Study 2).

Limitations

One strength of my studies is that I utilized the same questionnaires with both college students and older adults. By administering the same items to both samples, I was able to directly examine the complex relationships amongst all of these factors at different points in the life-span. These two studies allowed me to test my model in two different age groups. The results from both studies were consistent with my hypotheses offering strong empirical evidence to support my proposed model and suggesting that it generalizes to adults of various ages.

Despite my results generally supporting my hypotheses, several confounding factors may have influenced my results. Study 1 may have been impacted by a self-selection bias. By advertising the study as one examining physical activity levels, students who are not very physically active may not have volunteered. Also, participants were allowed to choose which testing session they wanted to attend as well as who they wanted to sit next to during the session. This potentially could have influenced a participant's answers when a less physically active person sat next to an NCAA athlete, particularly if this raised concerns about how his or her answers compared to others'. Therefore, to combat these issues, future studies should use a less descriptive title when recruiting participants and administer questionnaires in a more private setting to reduce self-selection bias and ensure more accurate results. Additionally, the three groups of college students were not well matched on demographic factors, with a higher representation of diverse racial groups in the NCAA athletes and fewer male students in the non-

athlete group. This distribution is representative of these student groups at Butler but may have introduced confounds into the results of the study. Future studies should attempt to utilize more balanced groups of students to the extent possible.

For Study 2, the low number of participants (N=50) potentially restricted the detection of significant effects. Also, many older adult participants had questions regarding the International Physical Activity Questionnaire (Booth-Kewley & Vickers, 2000). This is one reason why I did not analyze data from this measure. In addition, while the older adults were answering questions on the Physical Activity Index, the questionnaire I used to evaluate physical activity, a strong social desirability bias was apparent. Participants made comments about trying to find as many activities as possible to include, and they complained that the questionnaire made them feel inactive. Potentially, this could have caused my older adult participants to consciously or unconsciously exaggerate their self-reported physical activity levels to appear more physically focused. Future studies could combat this issue by selecting a physical activity questionnaire more specifically geared towards older adults.

Finally, both studies are limited by the correlational nature of this research design. Although I found support for my model, the direction of the relationships documented in this study cannot be definitely determined. Future prospective studies would be necessary to confirm the presumed causal relationships inherent in my model.

CONCLUSIONS AND FUTURE DIRECTIONS

While previous studies have indicated that adolescent involvement in sports and past gym grades directly influence physical activity later in life, my results suggest that physical self-perceptions may mediate these relationships. If this is the case it might be possible to alter individuals' physical activity levels in late adulthood by introducing an intervention designed to

increase physical self-efficacy or physical self-concept. Future studies could directly examine whether manipulating these self-perception factors in an experimental research design results in corresponding changes in actual physical activity levels in everyday life. While this might be most easily done with older adults, I believe it will be most useful if it is accomplished with adolescent children who potentially have lifetimes of physical activity to gain from increases in their physical self-perceptions.

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Appendix A

College Student Demographic Questionnaire

Your Age: _____ Gender: Male Female

Class Rank: Freshmen Sophomore Junior Senior

Ethnicity: African American Caucasian Asian Hispanic Other _____

For each of the sports listed below, please indicate whether you participated on a team during childhood (pre-school, elementary school, middle school), high school, and/or college by checking all of the appropriate boxes regardless of whether your team was school affiliated or not.

	Childhood	High School	College		Childhood	High School	College
Baseball				Swimming			
Basketball				Lacrosse			
Soccer				Rugby			
Football				Competitive Cheerleading			
Track				Competitive Dancing			
Cross Country				Golf			
Tennis				Competitive Martial Arts			
Volleyball				Boxing			
Gymnastics				Ice Skating			
Hockey				Bowling			
Softball							

Please list any additional organized sports you may have participated in, and indicate whether in childhood, high school, and/or college.

_____

_____

Do your parents regularly participate in any physical activities (e.g. running, aerobics, weight training, basketball, etc.)?

YES NO

If yes, list those activities. _____

_____

If you have any siblings, do they regularly participate in any physical activities (e.g. running, aerobics, weight training, basketball, etc.)?

YES NO

If yes, list those activities. _____

_____

Appendix B

International Physical Activity Questionnaire (Booth-Kewley & Vickers, 2000)

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the vigorous activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

   _____ **days per week**

   ☐ No vigorous physical activities → Skip to question 3

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

   _____ **hours per day**

   _____ **minutes per day**

   ☐ Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

   _____ **days per week**

   ☐ No moderate physical activities → Skip to question 5

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

   _____ **hours per day**

   _____ **minutes per day**

   ☐ Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

   _____ **days per week**

   ☐ No walking → **Skip to question 7**

6. How much time did you usually spend **walking** on one of those days?

   _____ **hours per day**

   _____ **minutes per day**

   ☐ Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the **last 7 days**, how much time did you spend **sitting** on a weekday?

   _____ **hours per day**

   _____ **minutes per day**

   ☐ Don't know/Not sure

Appendix C

Physical Activity Index (PAI) (Telama et al. 2004)

1. How often do you engage in leisure-time physical activity for at least half an hour per session?
    a. Not at all
    b. Less than once a month
    c. 2-3 times a month
    d. Once a week
    e. 2-6 times a week
    f. Every day

2. How much breathlessness and sweating do you experience when you engage in physical activity and sport?
    a. Not at all
    b. Moderate amount
    c. A lot

3. How many times a week do you usually engage in training sessions organized by a sport club?
    a. Not at all
    b. Occasionally
    c. Less than once a month
    d. Once a month or more
    e. Once a week
    f. Several hours and times a week

4. Do you participate in sports competitions?
    a. Not at all
    b. Sports club level
    c. Regional level
    d. National level

5. What do you usually do in your leisure time?
    a. I am usually indoors and read or do other sedentary activities
    b. I spend my time indoors and outdoors
    c. I usually walk or spend time with my friends
    d. I am usually outdoors and exercise quite a lot

6. Do you participate in a sport club at school or on an adult sports team?
    a. No
    b. Yes

7. What was your grade for physical education in your last school report?
    a. A
    b. B
    c. C
    d. D
    e. F

8. How far and by what means do you usually go to school/work?
    a. By car/bus
    b. By bicycle < ½ mile
    c. By bicycle < 1 mile or walk < ½ mile
    d. By bicycle >1 mile or walk over ½ mile

9. How often do you engage in rigorous physical activity?
    a. Not at all
    b. Once a month or more
    c. Once a week
    d. 2-3 times a week
    e. 4-6 time a week
    f. Every day

10. How many hours per week do you engage in rigorous physical activity?
    a. Not at all
    b. 30 minutes
    c. 1 hour
    d. 2-3 hours
    e. 4-6 hours
    f. > 7 hours

11. How much time do you usually spend in a physical activity session?
    a. < 20 minutes
    b. 20-40 minutes
    c. 40-60 minutes
    d. > 60 minutes

12. Do you participate in an organized physical activity?
    a. Not at all
    b. Occasionally
    c. Regularly, about once per week
    d. Several hours and times per week

Appendix D

Physical Self-Efficacy Scale (Ryckman et al. 1982)

1. I have excellent reflexes.
2. I am not agile and graceful. (R)
3. My physique is rather strong.
4. I can't run fast. (R)
5. I don't feel in control when I take tests involving physical dexterity. (R)
6. I have poor muscle tone. (R)
7. I take little pride in my ability in sports. (R)
8. My speed has helped me out of some tight spots.
9. I have a strong grip.
10. Because of my agility, I have been able to do things which many others could not do.

Appendix E

Physical Self-Concept Scale – adapted from the Athletic Identity Measurement Scale (Brewer, 1993)

1. I consider myself a physically active person.
2. I have many goals related to physical activity.
3. Most of my friends are physically active.
4. Being physically active is the most important part of my life.
5. I spend more time thinking about physical activity than anything else.
6. I need to participate in physical activity to feel good about myself.
7. Other people see me mainly as being physically active.
8. I feel bad about myself when I do poorly in a physical activity.
9. Physical activity is the only important thing in my life.
10. I would be very depressed if I were injured and could not be physically active.

Table 1. Age, Sex and Race Demographics for the Three College Student Groups and an Overall Sample in Study 1

	NCAA Athletes (N=44)	Intramural Athletes (N=28)	Non-Athletes (N=40)	Total (N=112)
Age: Mean (sd)	19.52 (1.17)	19.21 (1.20)	18.50 (2.89)	19.08 (2.01)
Percent Male	52.27	46.43	22.50	40.17
Percent White	70.45	92.86	87.50	82.06

Table 2. Relationships Among Early Life Predictors and Physical Activity and Physical Self-Perceptions in College Students in Study 1

	Physical Activity	Physical Self-Efficacy	Physical Self-Concept
Childhood Sports	.052	.169*	.094
High School Sports	.150	.274*	.105
Gym Grade	.266**	-.169	.207*

* Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

Table 3. Percentage of Each College Student Athletic Group Who Participated in Childhood or High School Sports and Who Earned an A in Their Last Gym Class

	NCAA Athletes	Intramural Athletes	Non-Athletes
Childhood Sports	No = 2 Yes = 98	No = 0 Yes = 100	No = 0 Yes = 100
High School Sports*	No = 0 Yes = 100	No = 4 Yes = 96	No = 14 Yes = 86
Gym Grade	Non-A = 2 A = 98	Non-A = 4 A = 96	Non-A = 18 A = 82

* Correlation is significant at the 0.05 level (2-tailed).

Table 4. Relationships Among Physical Activity, Physical Self-Efficacy and Physical Self-Concept in the Full Sample and Each Group of College Students in Study 1

	Physical Activity	Physical Self-Concept
	Full Sample	
Physical Self-Efficacy	.518***	.526***
Physical Self-Concept	.593 ***	1
	NCAA Athletes	
Physical Self-Efficacy	.130	.188
Physical Self-Concept	.449 **	1
	Intramural Athletes	
Physical Self-Efficacy	.372	.561**
Physical Self-Concept	.086	1
	Non-Athletes	
Physical Self-Efficacy	.319	.510**
Physical Self-Concept	.642**	1

**Correlation is significant at the 0.01 level (2-tailed).

***Correlation is significant at the 0.001 level (2-tailed).

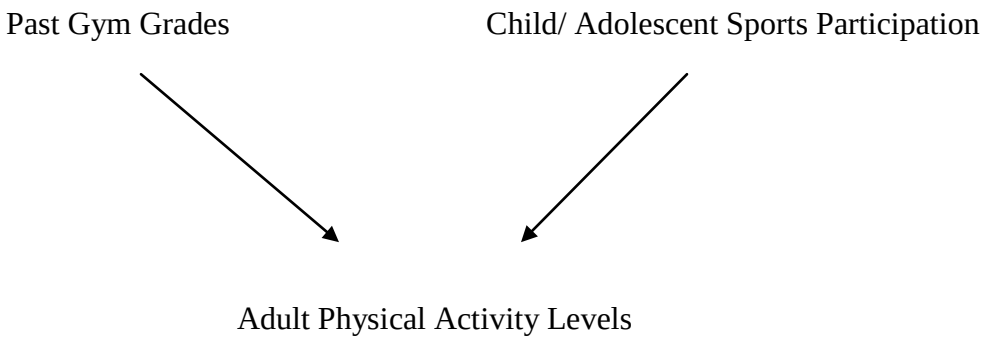
Table 5. Correlations Between Physical Self-Perceptions and Physical Activity Levels in Older Adults in Study 2

	Physical Self-Efficacy	Physical Self-Concept
Physical Activity	.354*	.275

* Correlation is significant at the .05 level (2-tailed).

Figure 1. Alternate Models Explaining Adult Physical Activity Levels: a) Model Based on Past Research; b) Current Proposed Model

a)



b)

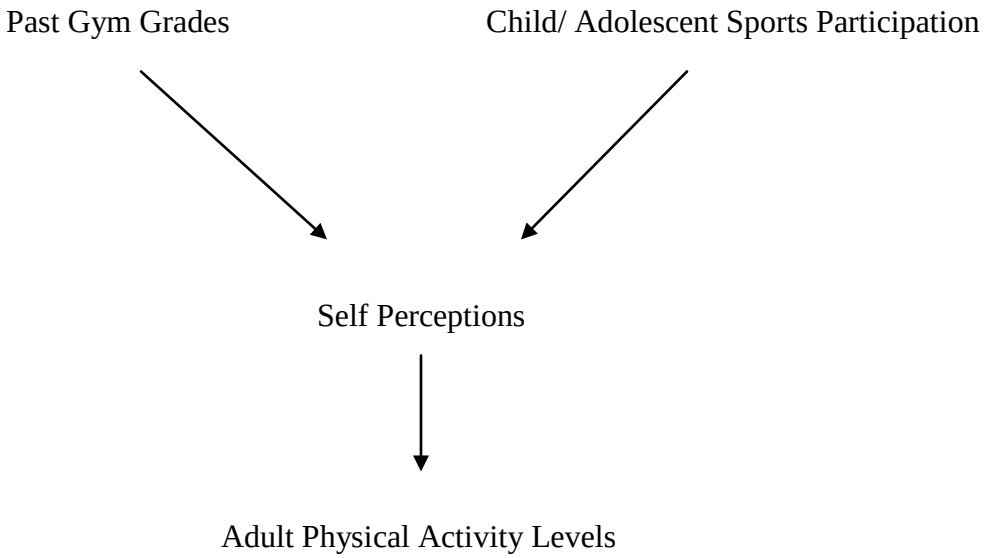
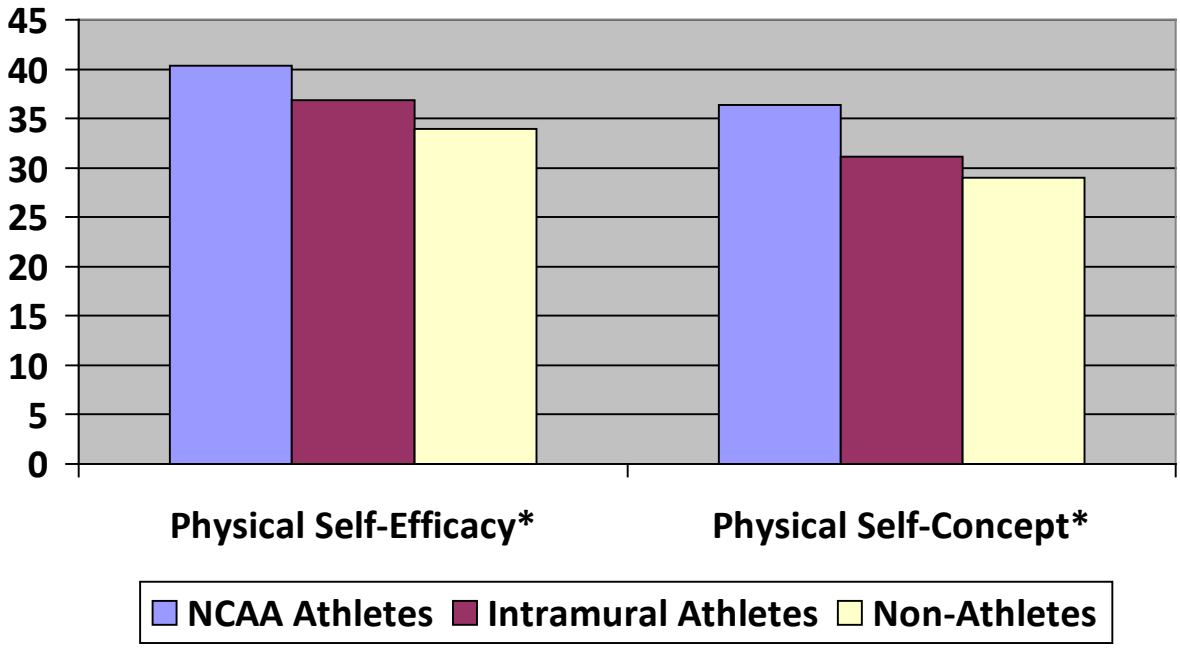
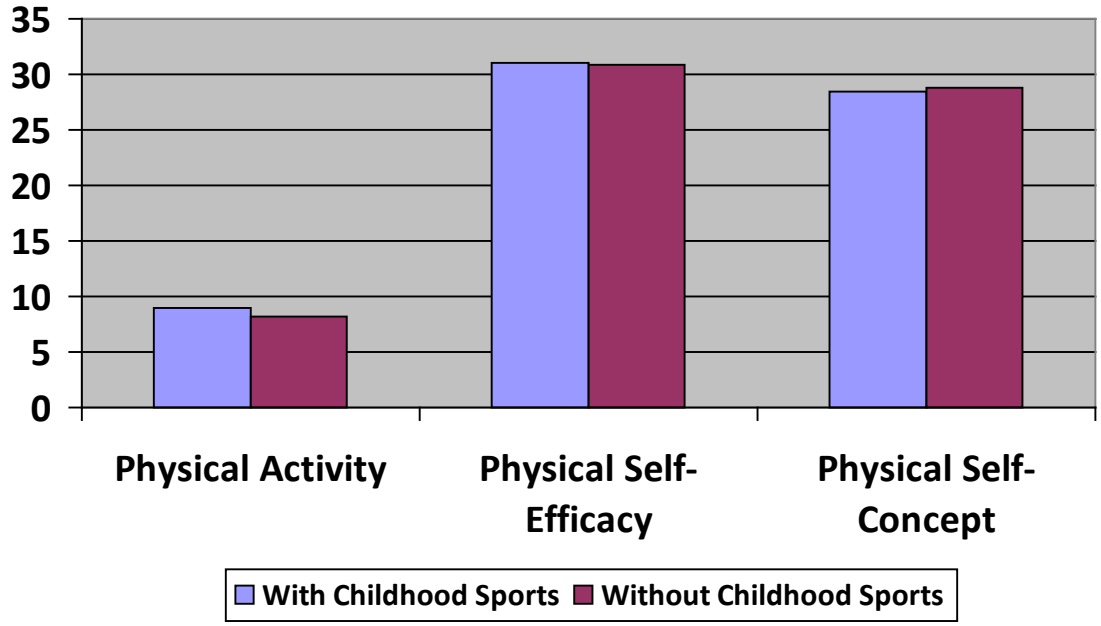


Figure 2. Between Group Comparison of NCAA Athletes', Intramural Athletes' and Non-Athletes' Physical Self-Perceptions



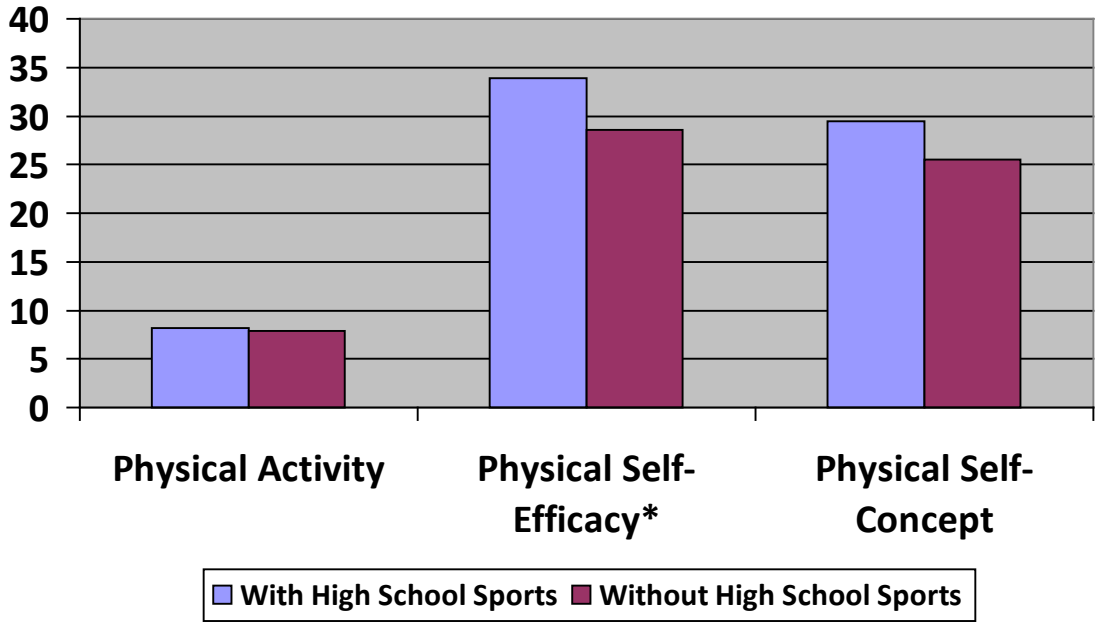
* Groups differ significantly in one-way ANOVA analyses (both ps < .001).

Figure 3. Mean Comparison of Older Adults Who Participated in Childhood Sports Versus Older Adults Who Did Not



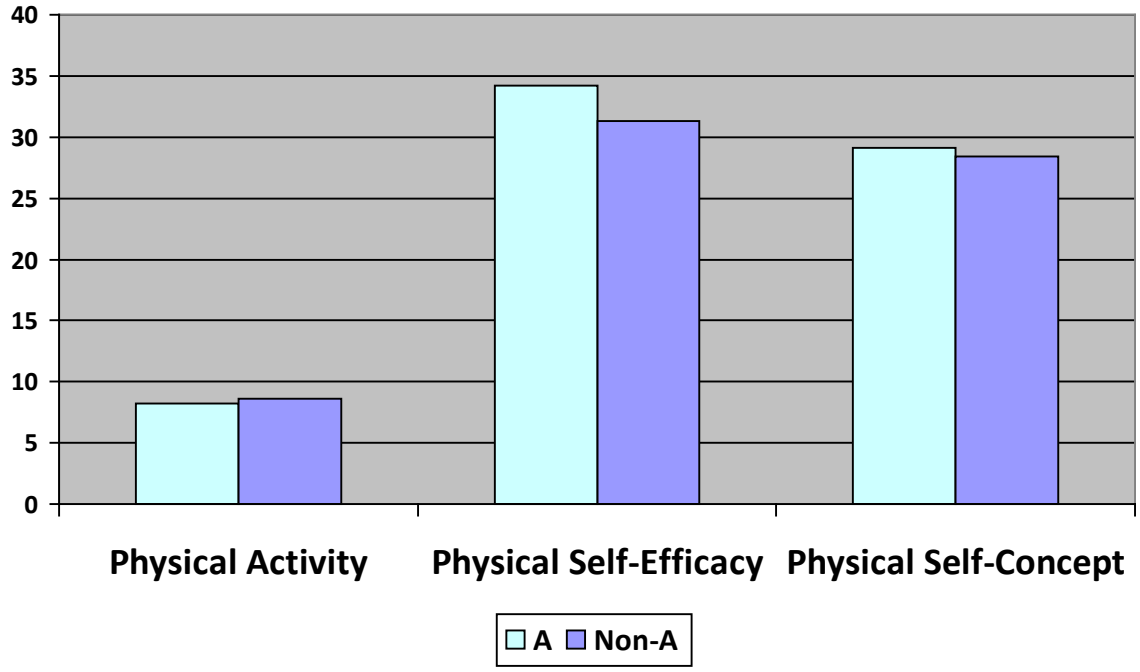
* Groups differ significantly in an independent samples t-test ($p < .05$).

Figure 4. Mean Comparison of Older Adults Who Participated in High School Sports Versus Older Adults Who Did Not



* Groups differ significantly in an independent samples t-test ($p < .05$).

Figure 5. Mean Comparison of Older Adults Who Earned an A for Their Last Gym Grade Versus Older Adults Who Earned Lower Gym Grades



Note: Groups did not differ significantly on any of the outcome variables.