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A social ecological analysis of physical activity promotion for overweight and normal weight youth

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TABLE OF CONTENTS

INTRODUCTION

The high prevalence of youth obesity is unprecedented and continues to escalate. According to the September 2006 Institute of Medicine report, over the past 30 years "the obesity rate has nearly tripled for children ages 2-5 years (from 5 to 14 percent) and youth ages 12-19 years (from 5 to 17 percent), and quadrupled for children ages 6-11 years (from 4 to 19 percent; p.1)." Because excess adiposity in youth is associated with adult obesity and its concomitant ramifications, the increasing prevalence of overweight in youth is one of the most pressing public health problems facing the country (Koplan, Livermore, & Kraak, 2004).

Childhood and adolescence are periods in life in which chronic disease is generally rare. However, as the prevalence of youth overweight increases, so do the associated chronic diseases such as diabetes mellitus, dyslipidemias, insulin resistance, asthma, and orthopedic problems (Freedman, Dietz, Srinivasan, & Berenson, 1999). Because obesity and cardiovascular risk factors have been shown to track throughout the lifespan, many overweight children are likely to be at increased risk for chronic disease throughout their lifespan. As just one example of the chronic disease implications of obesity, it is estimated that one out of three children born in the year 2000 will go on to develop diabetes mellitus at some point in their lives (Narayan, Boyle, Thompson, Sorensen, & Williamson, 2003).

Given that genetic changes alone cannot account for the decrease in physical activity and increase in obesity (Clement & Ferre, 2003), an "obesigenic" environment that contributes to inactivity and overeating has been implicated as a major contributing factor in the obesity epidemic (Hill & Melanson, 1999; Jeffery & Utter, 2003). Neighborhoods without sidewalks and the promotion and availability of fast food are examples of an environment with limited opportunities for physical activity and enticements to overeat.

The increasing prevalence of youth obesity suggests the need to better distinguish the possible behavioral and psychosocial differences related to physical activity between overweight and normal-weight youth. The psychosocial correlates and determinants of youth physical activity have not been well scrutinized in the context of the relatively new phenomenon of a larger population of overweight youth. As the limited influence of psychosocial interventions on behavior change become clear with the lack of success in improving physical activity behavior (Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2003), it is evident that additional research is needed to understand the impact of environmental supports and characteristics. In particular, little is known about the unique social ecological parameters (e.g., culture and environment) of physical activity promotion for youth from the rural state of Iowa .

The purpose of this research is to examine possible differences in psychosocial correlates between overweight or at-risk for overweight (OAR) and normal weight (NW) youth. In addition, social ecological influences including level of urbanization, socioeconomic status, and parental influence are examined. **The rationale for this research is that by examining unique subpopulations (rural vs. urban; overweight vs. normal overweight) within a psychosocial and social ecological framework, the theoretical basis for designing physical activity interventions for youth in communities and schools across Iowa will be strengthened.** A secondary purpose of this research is to ensure the measurement tools used to evaluate the psychosocial and social ecological correlates of physical activity are valid for overweight youth.

The theoretical framework used to guide this research is the Youth Physical Activity Promotion model (YPAP; Welk, 1999). The model was developed to understand youth physical activity behavior and was developed based on the PRECEDE/PROCEED Model of health behavior (Green & Krueter, 1991). More information on the model is included in Chapter 4.

Four separate studies were completed as part of this dissertation research.

- Study 1: "The Predictive Utility of the Children's Physical Activity Correlates Scale" (Schaben, Welk, Joens-Matre, & Hensley, 2006).
- Study 2: "Rural–Urban Differences in Youth Physical Activity and Prevalence of Overweight"
- Study 3: "Validation of the Children and Youth Physical Self-Perception Profile with Overweight Youth"
- Study 4: "Youth Physical Activity Promotion: Does Overweight Make a Difference?"

Studies 1, 2, and 4 involve analyses of data obtained from the Physical Activity and Nutrition Among Rural Youth (PANARY) project. This state-wide project, conducted in collaboration with colleagues from the University of Northern Iowa (Larry Hensley, Principal Investigator), includes the assessment of physical activity and physical fitness levels of urban and rural youth from across the state of Iowa. A brief description of the PANARY project is presented in the Appendix.

The first two studies are viewed as pilot studies because they established the basis for the main research studies of this dissertation (Study 3 and Study 4).

Study 1 established the validity of the Children's Physical Activity Correlates Scale across multiple grade levels. This is important given that previous research has only tested these scales on youth from elementary grades (Welk, Wood, & Morse, 2003). The participants included 1,033 male and 962 female youth who participated in the PANARY project during the 2002–2003 school year. The Children's Physical Activity Correlates (CPAC) Scale was used to assess the major psychosocial correlates of physical activity, and the Children's Physical Activity Questionnaire for Adolescents (PAQ-A) was used to assess typical levels of physical activity. The addition of sequential hierarchical multiple regression to demonstrate that the reinforcing factors were partially mediated by perceived competence and attraction to physical activity allowed a new perspective on the findings and conclusions of the study.

Results indicated that the sample of high school youth had lower levels of physical activity and lower scores of perceived competence, attraction to physical activity and perceptions of parental influence than middle school youth. Parental Influence accounted for ~15% of the variance in physical activity whereas the predisposing factors (Perceived Competence and Attraction to Physical Activity) accounted for 20% and 17% of the variance for middle and high school students, respectively. The study extended past work with the CPAC measures that validated the tool with elementary grade children (Welk et al., 2003). The results established that the CPAC can be used effectively across a wide age range to understand factors influencing physical activity behavior because of consistency of variance in physical activity accounted for across age groups (R^2 = 32% - 35%). The relationships observed in the pilot study led to research questions about potential mediators and moderators of physical activity by level of urbanization, gender, and weight status.

Study 2 involved an examination of differences in physical activity and prevalence of overweight in children by level of urbanization, representing the “enabling” factors of a social ecological framework. The results provided descriptive information about physical activity and fitness in addition to new and alarming evidence of the extent of the youth obesity problem in Iowa. Both Study 1 and Study 2 led to the hypothesis that there may be differences in psychosocial correlates of physical activity between normal and overweight youth.

Study 3 was conducted in an urban high school in order to have a large enough sample of overweight youth for a confirmatory factor analysis of the Children and Youth Physical Self-Perception Profile. This study focused primarily on “predisposing” factors related to physical activity, yet also was set in the enabling context of a higher socioeconomic urban area. In addition, the large sample of youth from a single school afforded the opportunity to compare physical self-perceptions by gender and weight status, without the confounding effect of nested data due to different schools.

Study 4 is the most comprehensive examination of potential differences in youth physical activity promotion by age, gender, and weight status within the dissertation. This final study examined physical activity behavior of youth within the complete framework of “predisposing,” “enabling,” and “reinforcing” factors.

Dissertation Organization

This dissertation includes an extended review of the literature in chapter 1; followed by separate chapters devoted to Study 2, Study 3, and Study 4 (Study 1 has been published in the Journal of Physical Activity and Health). A summary of the results from all of the research is included in chapter 5. Tables and figures will appear at the end of each study and surveys and codebooks are in the Appendix.

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CHAPTER 1

A SOCIAL ECOLOGICAL ANALYSIS OF PHYSICAL ACTIVITY PROMOTION FOR OVERWEIGHT AND NORMAL WEIGHT YOUTH: AN EXTENDED REVIEW OF THE LITERATURE

When given the opportunity, youth will accumulate considerable physical activity throughout the day (Pangrazi, Corbin, & Welk, 1996). Although youth may be inherently active, the opportunities to be active have declined. Where once walking to school, regular physical education, recess, and playing outdoors was the norm for youth, now many are transported to school by car or bus, have limited physical education and recess time, and play videos or watch TV after school. What has changed is that physical activity is now *a deliberate choice* rather than an inherent part of the day, thus the decision-making process to engage in physical activity is more important than ever for youth. That choice may be more difficult for those who are overweight.

It has been suggested that the zeal which has accompanied the recognition of obesity as a national health problem may actually intensify the prejudice toward those who are overweight and this will, in turn, negatively impact community health (Cohen, Perales, & Steadman, 2005). Cohen et al. (2005) presented evidence that suggests focusing exclusively on weight has serious consequences for mental health and alternatively recommended a focus on healthy lifestyles. In this same spirit, embracing physical activity as a natural component of healthy living rather than simply as a means to avoid obesity, this dissertation will focus on exploring the promotion of physical activity that is inclusive of youth who are overweight.

Youth today are less likely to engage in recess or school physical education, walk or bike to school, or play outdoors unrestricted after school (Centers for Disease Control and

Prevention [CDC], 2004a). According to the 2003 Youth Behavior Risk Survey, 33.4% of middle and high school students participated in an insufficient amount of physical activity during the previous seven days (CDC, 2004a). Results from the 2005 Youth Risk Behavior Surveillance (CDC, 2006b) showed that only 25.6% of Iowa high school girls and 42% of Iowa high school boys met or exceeded the recommended level of physical activity (i.e., activities that made them sweat or breathe hard for a total of 60 min on at least 5 of the last 7 days preceding the survey). Other evidence shows youth may engage in only 8-15 min of aerobic activity per day (Janz, Dawson, & Mahoney, 2001; Strauss & Pollack, 2001). The reasons for the reduced amount of physical activity include fewer physical education requirements, safety issues, greater access to video games, computers, and television watching, plus labor-saving modern conveniences (CDC, 2003).

The reduced participation in physical education seems to be accounting for much of the decline in physical activity and associated increased prevalence of overweight (Gordon-Larsen, McMurray, & Popkin, 2000). In Iowa, only 9.3% of girls and 11.3% of boys reported daily physical education (CDC, 2006a). As an example of the potential importance of physical education in reversing the increase in obesity, early elementary girls who were overweight or at risk for overweight reduced their body mass index when one more hour per week of physical education during school time was added (Datar & Sturm, 2004).

Physical activity decreases with increasing age in youth (CDC, 2004b; Prochaska, Sallis, Slymen, & McKenzie, 2003). Insufficient physical activity is higher in girls (CDC, 2004b), with a particularly significant decline from ages 6–9 as compared to boys (Goran, Gower, Nagy, & Johnson, 1998). A longitudinal prospective 10-year study by Kimm et al. (2002) showed that between ages 9–10 and 16–17, median habitual leisure-time physical activity declined by 100% in African American girls (n = 1,213) and 64% in white girls (n = 1,166). Although the psychosocial correlates of physical activity by age, gender, and race/ethnicity have been widely examined, the impact of the higher prevalence of overweight may modify those associations.

Physical Activity and Overweight Youth

Being overweight may pose an additional barrier to youth being physically active. Many overweight children do not perform as well in physical activities, and thus have less participation in physical education, sports, and games (Barlowe & Dietz, 1998). Although it is generally accepted that excess adiposity impedes the ease of physical activity, gaps remain in the literature regarding the reciprocal nature of the psychosocial effects of obesity on motivation to engage in physical activity.

Youth physical activity is vital for cardiovascular health, bone health, muscular strength, and endurance (Warburton, Nicol, & Bredin, 2006). Physical activity is also essential for self-esteem and psychological health (Calfas & Taylor, 1994; Fox, 2000; Strauss, Rodzilsky, Burack, & Colin, 2001). In a review by Fox, 78% of the studies showed exercise programs were associated with improved physical self-concept and self-esteem. The effect sizes, although generally small to moderate, were greater among children who were initially low in self-esteem.

Benefits of Physical Activity for Overweight Youth

Given that energy expenditure is greatly increased through physical activity, it is widely accepted to be a critical component of effective weight control or weight loss programs. The research linking physical activity/inactivity to obesity has been inconsistent, but the evidence from most longitudinal studies support the association of lack of physical activity and excess sedentary behaviors (e.g., watching television) with overweight and obesity (Ihmels, Welk, & Schaben, 2006). The failure of some researchers to confirm these relationships may be due to measurement challenges associated with assessing physical activity (Welk, 2002).

There are physical health benefits for overweight youth beyond the simple increase in energy expenditure from physical activity. Physical activity may also mitigate some of the negative effects of being overweight on physical health. For example, physically active overweight children did *not* have increased total cholesterol and blood pressure compared to physically inactive overweight children, suggesting a protective effect of physical activity for overweight youth (McMurray, Herrel, Bangdiwali, & Deng, 1999). Another study showed greater physical activity in adolescent girls improved insulin sensitivity and inflammatory markers even though body mass index was unchanged (Nassis et al., 2005). The evidence of physical activity being a more important factor for health than fatness has been more extensively documented for adults (Lee, Blair, & Jackson, 1999) but there is evidence that the protective effect is evident in youth as well (Eisenmann et al, 2005; Gutin, Yin, Humphries, & Barbeau, 2005).

Psychosocial Benefits of Physical Activity for Overweight Youth

Few researchers have specifically investigated the psychosocial benefits of physical activity for overweight youth, particularly within the social context of the recent higher prevalence of overweight. Youth obesity is more immediately associated with stigmatization and negative psychosocial conditions including depression, poor self-esteem, and alienation (Strauss & Pollack, 2003; Williams, Wake, Hesketh, Maher, & Waters, 2005). These negative psychosocial conditions may also impede motivation to be physically active.

Deforche, De Bourdeaudhuij, Tanghe, Hills, and De Bode (2004) examined changes in physical activity and psychosocial determinants of physical activity among youth being treated for obesity. The researchers noted that although physical activity participation improved during the 6-month intervention, very little change in perceived benefits, barriers, or self-efficacy was reported; however, social support by family members increased. However, increases in physical activity and family support were not maintained after the treatment.

In a physical activity intervention study with at-risk for overweight adolescent girls, improvements in perceived social support were reported (Neumark-Sztainer, Story, Hannan, Tharp, & Rex, 2003). Perceived barriers and social support showed the highest correlations (r = -.42 and .28, respectively) with physical activity. Other measured variables included body satisfaction, depression, self-acceptance, physical appearance, self-worth, self-efficacy, perceived benefits, enjoyment, and body mass index (Neumark-Sztainer et al.). Despite the large number of variables considered in the study, much of the variance in physical activity was not explained.

Factors Influencing Youth Physical Activity

Youth physical activity behavior is influenced by biological, psychosocial, and environmental factors. A review by Sallis, Prochaska, and Taylor (2000) identified gender, parental weight, perception of barriers, previous physical activity, healthy diet, program access, and time spent outdoors as significant psychosocial and sociodemographic correlates of physical activity for children. For adolescents, significant correlates of physical activity included gender, ethnicity, age, perceived competence, intention, depression, previous physical activity, community sports, sensation seeking, parental support, sibling physical activity, and opportunities for physical activities. This extensive review was based on population-based studies rather than targeted subgroups at higher risk for physical inactivity. Further studies have elaborated on the predominant psychosocial correlates among youth physical activity which include attraction, enjoyment, social support, self-efficacy, and perceived competence (De Bourdeaudhuij et al., 2005; President's Council on Physical Fitness and Sports, 2000). High school youth typically report slightly lower levels of these psychosocial correlates than middle school youth, and girls report slightly lower levels than boys (Sallis et al., 2000; Schaben, Welk, Joens-Matre, & Hensley, 2006).

Because the high prevalence of overweight youth is unprecedented, there is a paucity of information regarding the possible differences in psychosocial correlates of youth physical activity based on being overweight and its multifactorial relationship with age, gender, and other socioeconomic characteristics. The results are equivocal for the influence of overweight and age, gender, and race/ethnicity appear to play a role.

Key Psychosocial Variables

Attraction

Attraction (operationalized as liking of games and enjoyment of physical activity) to physical activity is thought to be the primary psychosocial determinant of youth physical activity (Dishman et al., 2005). Boys typically report higher levels of attraction or enjoyment of physical activity than girls and attraction typically decreases with increasing age in youth (Sallis et al., 2000). Several studies have reported lower enjoyment (a corollary of attraction) of physical activity among overweight youth (Fulkerson et al., 2004; Ward et al., 2006). In contrast, a longitudinal study by Prochaska et al. (2003) did not find that body mass index affected enjoyment of physical education among elementary students. However, the potential curvilinear relationship between BMI and physical education enjoyment was not tested in that study. Specifically, when a simple analysis of variance is used, it cannot capture curvilinear relationship that may occur at the breakpoint of obesity. Obesity may be best described as a threshold rather than a continuous variable. The condition of being very lean does not necessarily hold any advantage over being lean but still not obese. In addition, in this study BMI and not BMI-for-age levels were reported, reducing the accuracy of the categories.

Social Support

Social support enhances the likelihood of youth engaging in physical activity, through encouragement, role modeling, and access to facilities or programs. The relative contribution of parental, teacher, and peer influence is malleable throughout the course of childhood, with peers exerting a stronger influence with advancing age. Social support from parents, peers, and teachers may be particularly important for overweight youth (Neumark-Sztainer et al., 2003).

There is evidence that children who are overweight receive more negative feedback when physically active from peers, parents (De Bourdeaudhuij et al., 1999; Faith, Leone, Ayers, Heo, & Pietrobelli, 2002), and teachers (Schwartz, Chambliss, Brownell, Blair, & Billington, 2003). The children in the Faith et al. study who reported more criticism also reported more negative attitudes toward physical activity. Girls reported higher levels of weight criticism than boys during physical activity. Another study of pre-adolescent girls found overweight girls perceived more influence from parents, but the specific type of influence (encouragement vs. criticism) was not identified (Fulkerson et al., 2004).

Self-efficacy

Self-efficacy refers to the cognitive, motivational, emotional, and locus of control attributes that make up a specific belief or confidence (Bandura, 1977). It is frequently cited as an important concept in the perception of barriers to participation in physical activity. Self-efficacy is an important predictor of the physical activity levels of overweight adolescent girls (Neumark-Sztainer et al., 2003). A number of studies have shown that overweight youth have less physical activity self-efficacy than non-overweight youth (Fulkerson et al., 2004; Trost, Kerr, Ward, & Pate, 2001). In a corollary finding, overweight youth may perceive greater barriers to physical activity (Fulkerson et al.; Zabinski, Saelens, Stein, Hayden-Wade, & Wilfley, 2003). Most researchers have assumed that low self-efficacy is a mediating variable between obesity and physical activity. It is equally likely that overweight conditions lead to inactivity, which then leads to lowered self-efficacy.

Perceived Competence

Perceived competence is related to self-efficacy but refers more to ability efficacy rather than personal agency. Perceived physical or athletic competence relates to how individuals evaluate their adequacy in sports, physical attractiveness, and physical activity. Youth who report higher physical/athletic competence are more likely to enjoy and participate in such activities (Weiss & Ebbeck, 1996). Gender differences have been shown for perceived competence, as boys report higher levels than girls although the differences shown have been small (d = .36; Schaben et al., 2006).

Overweight youth have been reported to have lower perceived physical competence (Fulkerson et al., 2004), but the relationship between being overweight, physical activity, and perceived competence is unclear. Overweight girls who had higher perceived competence were more likely to be active (Neumark-Sztainer et al., 2003), although the directionality of this relationship was not determined. In a study by Zabinski et al. (2003), overweight youth attending a weight-loss camp had lower athletic competence than both overweight youth not in treatment and normal-weight youth. The difference in the degree of overweight between the treatment group (parents had enrolled their child in a summer weight-loss camp) and non-treatment group was not specified. Furthermore, the comparison group of normal weight youth were from a different area of the country and the age range (10–14) was smaller than for the overweight group (8–16 years of age). Age, maturity, geography, and degree of being overweight were not adjusted for in the analysis of that study, adding to the ambiguity of the results.

Physical Self-perception

In addition to the previously listed psychosocial correlates, physical self-perception may play a key role in determining the level of physical activity participation by overweight youth. Physical self-perception describes the factors that comprise a person's evaluation of his/her physical self. Physical self-worth is the affective evaluation of physical self-perception, which mediates the relationship between physical self-perception and self-esteem. Four distinct subdomains have been found to be consistently related to a person's physical self-worth: (a) body attractiveness adequacy, (b) physical conditioning adequacy, (c) strength competence, and (d) sport competence (Fox & Corbin,1989). Physical self-worth has, in turn, been shown to be related to a person's self-esteem (Sonstroem & Morgan, 1989). Sonstroem (1984) has further clarified this relationship by positing "that it is the individual's perception or attitude about personal fitness that is related to self-esteem, rather than the fitness itself" (p.130).

The Physical Self-Perception Profile (originated by Fox & Corbin, 1989), which includes physical self-worth in addition to the four subdomains, has accounted for a moderate amount of the variance in the physical activity of college students (Fox & Corbin, 1989; Sonstroem & Potts, 1996). Using a revised version of the scale, the Children and Youth Physical Self-Perception Profile (Welk, Corbin, & Lewis, 1995; Whitehead, 1995), physical self-perception showed low-moderate correlations with physical activity (r = .32 - .44) in elementary school youth (Welk & Eklund, 2005), middle school youth (Eklund, Whitehead, & Welk, 1997) and high school athletes (Welk et al., 1995).

Physical self-perception is consistently identified as an important construct in the relationship between being overweight and physical activity. Adolescent girls at risk for being overweight that improved physical self-perception were more likely (regression coefficient = .11; estimated increased physical activity time was 19 min per week) to be physically active (Neumark-Sztainer et al., 2003). Furthermore, Zabinski et al. (2003) found that overweight youth, particularly girls, indicated body consciousness (e.g., concern about others seeing their bodies while being active) as the most common barrier to physical activity. "Indeed, the perception of body awareness or consciousness as a potent barrier to physical activity seemed unique to overweight youth, as body-related barriers were the only type of barrier that differed between overweight and non-overweight boys" (Zabinski et al., p. 242). This link between physical self-perception and physical activity may be moderated by ethnicity. In a study of African American adolescent girls, overweight girls had a larger ideal body size, thus were less motivated to be physically active for different reasons (Gordon-Larsen, 2001).

Physical self-perception may be a key variable in the association between psychosocial variables and physical activity. Physical self-perception was the only psychosocial variable among many across bi-ethnic boys and girls that showed significant associations with physical activity (Morgan et al., 2003). Figure 1.1 shows a conceptual model of how significant adults and peers influence self-perceptions, enjoyment, and motivation (President's Council on Physical Fitness and Sports, 2000). The model illustrates

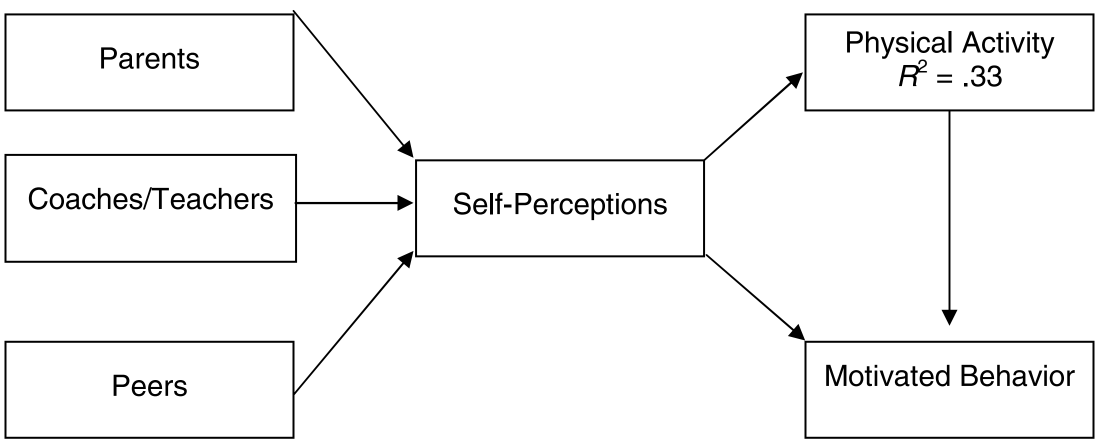

Figure 1.1. A conceptual model of the mediating effect of self-perceptions on enjoyment and motivated behavior towards physical activity (adapted from a diagram shown in President's Council on Physical Fitness and Sports Bulletin, 2000).

how parents, coaches/teachers, and peers may influence a person's self-perceptions, which in turn influences enjoyment and motivated behavior towards physical activity.

Physical Activity and Overweight Youth: Gaps

A systematic MEDLINE review of studies comparing psychosocial correlates of physical activity for overweight and normal weight youth have shown weak or conflicting results (see Table 1.1). In two of the larger studies located, there were no differences in

Table 1.1.

Studies Comparing Psychosocial Correlates of Physical Activity (PA) by Weight Status

Authors	Sample	Constructs	OW/NW Comparison[a]
Ball, et al., 2005	Youth ages 6–10 *at* risk of overweight (*n* = 20) ; *n* = 115 NW)	Social acceptance	In a 12-month observational study, NW youth reported a higher level of social acceptance
De Bourdeaudhuij,, et al. 2005	11–19-year-old youth from 38 secondary schools (*N* = 6078)	Social support, self-efficacy, barriers/benefits	No significant differences between OW and NW youth. Suggests no specific tailoring on psychosocial correlates of PA is necessary for overweight adolescents
Faith, et al., 2002	5th to 8th grade youth (*N* = 576)	Weight criticism, sports enjoyment, coping skills	↑ weight criticism related to ↓ sports enjoyment
Fulkerson, et al., 2004	9–11 year-old girls (*N* = 295) and their mothers	Physical activity barriers, benefits, self-efficacy, enjoyment, and social influence	↑ barriers ↑ social influence ↓ self-efficacy ↓ per comp ↓ enjoyment of PA
Gordon-Larsen, 2001	African-American female adolescents ages 11–15 (*n* = 32); OW and NW matched pairs	Attitudes, knowledge, body image, self-esteem	No significant difference in self-esteem, attitudes, or knowledge ↓ body-image
Haverly & Davison, 2005	Adolescent girls (*n* = 92) and boys (*n* = 110)	Personal fulfillment, sport competence, weight-based motivation	↑ weight-based motivation ↓ sports competence, personal fulfillment, motivation
Pesa, et al., 2000	Female participants (*N* = 3197) of the National Longitudinal Study of Adolescent Health	Depression, self-esteem, school, family and community support autonomy, grades.	↓ lower self-esteem, ↓ body image.
Trost, et al., 2001	Ethnically diverse middle school students (*n* = 133 NW: *n* = 54 OAR)	PA self-efficacy; social influences, beliefs about PA outcomes, perceived PA levels of parents and peers	↓ PA self-efficacy, ↓ report father or male guardian as physically active
Ward, et al., 2006	Girls (45% African-American) mean age 14.6 (*N* = 1015)	Self-efficacy, attitudes, perceived behavioral control, enjoyment, family support, environment	No significant differences of social-cognitive correlates between OW and NW girls.
Zabinski, et al., 2003	OW youth ages 8–16 (*n* = 84); NW youth ages 10–14 (*n* = 80)	Barriers to PA, social support	↑ body-related, resource, and social barriers ↓ lower levels of adult support ↑ barriers, including body consciousness for female adolescent ↓ body-esteem

[a]↓ decrease; ↑ increase

psychosocial correlates of physical activity between overweight and non-overweight youth (De Bourdeaudhuij et al., 2005; Ward et al., 2006), yet other studies have shown differences differences (Ball, Marshall & McCargar, 2005; Faith et al., 2002; Fulkerson, et al., 2004; Gordon-Larsen, 2001; Zabinski et al., 2003). The discrepancies may be tied to measurement issues, the confounding effects of maturity, and the relative newness of the high prevalence of youth who are overweight. Undeveloped scales were used to assess psychosocial correlates in several studies (Ball et al., 2005; Faith et al., 2002; Zabinski et al., 2003). Researchers in one study asked 6- to 8-year-old youth to self-report levels of social acceptance (Ball et al.), which is younger than the age typically recommended for self-report surveys. Surveys should first be developed to a point of psychometric soundness so that the instruments are reliable, show construct and discriminant validity, as well as predictive utility when used to describe population characteristics. However, it is also possible that previously validated scales may not exhibit similar psychometric properties when used with a population subgroup such as overweight youth (Lewis, Marcus, Pate, & Dunn, 2002).

Youth studies may also be complicated by differing maturity levels at similar ages. Physical activity, body mass index, and even psychosocial variables are affected by puberty, so some of the differences noted may actually be due to maturity rather than weight status. Two studies encompassed age ranges where maturity levels differed, but this was not accounted for in the discussion of the results (e.g., Faith et al., 2002; Zabinski et al., 2003).

Finally, although several researchers included environmental measures in their analysis of differences in physical activity between overweight and non-overweight youth (Pesa, Syre, & Jones, 2000; Ward et al., 2006), social ecological analysis is still in the developmental stage. Furthermore, cultural, socioeconomic, and climate differences may limit broad generalizations regardless of the quality of the study. Despite these and other limitations, it is imperative to continue researching the psychosocial and social-ecological correlates of physical activity in light of the obesity epidemic. Psychosocial implications are important as they may be linked to a cycle of obesity–inactivity–obesity (Evans & Gates-Wieneke (2004).

Importance of a Mediating Variable Framework

Identifying psychosocial correlates is just one step in elaborating the complex interplay of socio-demographics, motivating factors, and personal attributes that result in a behavior change such as increasing physical activity. The psychosocial correlates described are encompassed within several well-developed theoretical models, including social cognitive theory, behavioral learning theory, the stages of change (transtheoretical) model, theory of planned behavior, and the health belief model (Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2003).

These theories imply a dynamic inter-relationship between variables rather than simple association. Designing research to explore the mediating and moderating influence of the components of these theories is essential in moving the collective knowledge of physical activity promotion forward through targeted interventions. In a review of psychosocial mediators of physical activity, only two studies of youth were found that examined theoretical constructs (i.e., mediators) in the context of interventions to increase physical activity (Lewis et al., 2002).

Identifying psychosocial mediators of physical activity-promoting behaviors, particularly within population subgroups, is needed to determine more effective behavior change strategies (Baranowski, Anderson, & Carmack, 1998; Bauman, Sallis, &

Dzewaltowski, 2002; King, Stokols, Talen, Brassington, & Killingsworth, 2002). Although it has long been recognized that such variables as age, gender, and ethnicity/race are important in developing targeted interventions, the weight status of individuals may now need to be considered as well.

Social Ecological Approaches

Broad social ecological approaches to health promotion are widely recognized as the most effective approach for altering the complex social and environmental factors that influence the obesity epidemic (Booth et al., 2001; Dzewaltowski, Estabrooks, & Glasgow, 2004; King et al., 2002). Key recommendations from the American Academy of Pediatrics (2003) to prevent childhood obesity were to assess social and environmental factors that facilitate or impede physical activity in overweight youth. The Centers for Disease Control and Prevention has similarly recommended that solutions be framed within a social ecological model.

Youth Physical Activity Promotion Model

One model that encompasses both behavior change theory and the social ecological environment is the Youth Physical Activity Promotion Model (Welk, Babke, & Brustad, 1998). The past limitations of social ecological models were the absence of motivational variables (Baranowski et al., 2003). The youth physical activity promotion model includes cognitive and motivational variables (Welk, 1999). It encompasses social-cognitive theory (Bandura, 1986) as well as efficacy expectations (Eccles, Adler, & Kaczala, 1982). The model includes “Enabling,” “Predisposing,” and “Reinforcing” factors, which are related to the social ecological theory and based on the PRECEDE–PROCEED planning model (Green & Kreuter, 1991). Two underlying principles of the PRECEDE-PROCEED model are that health and health risks are caused by multiple factors; therefore, efforts to improve health must address a multiplicity of factors. The causes of the health behaviors are identified as "predisposing" factors (knowledge, attitudes, beliefs), "reinforcing" factors (support or non-support of family, teachers, and friends), and "enabling" factors (skill, opportunity, and access). Figure 1.2 illustrates the relationships of these variables as described in the Youth Physical Activity Promotion model.

Preliminary work has indicated an adequate fit of the model to the data, but the model has not been tested further (Pate & Sirard, 2000). Furthermore, the large sample of Iowa youth provides the opportunity to examine the model, including the factor of weight status, in more detail.

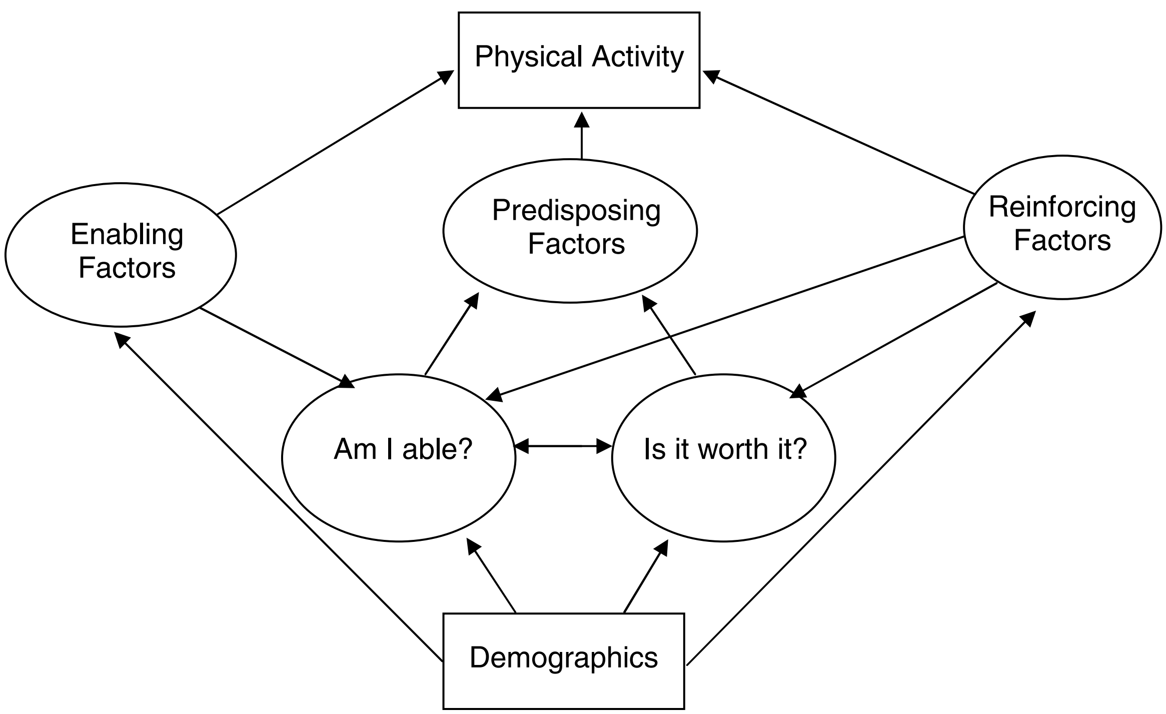

Figure 1.2. Conceptual diagram of the Youth Physical Activity Promotion Model.

Measurement that is valid, reliable, and utilitarian is the first step in identifying multi-level solutions to the complex problem of declining youth physical activity and increasing prevalence of youth obesity. Examining psychosocial mediators of behaviors and identifying social ecological leverage points for promoting physical activity can provide valuable information for future targeted interventions for overweight youth. In addition, comprehensive models that are reliable, valid, and utilitarian can serve as a framework in which to evaluate intervention research. Research evaluating these issues is described in Study 1, Study 3 (Chapter 3), and Study 4 (Chapter 4).

Psychosocial Implications of Youth Obesity

The physical health implications of obesity typically receive the most attention in both the scientific and lay literature, but comparatively little is known about the psychosocial ramifications of the changing shape of our society. These untoward effects seem to particularly affect white adolescent girls (Erickson, Robinson, Haydel, & Killen, 2000; Faulkner, Neumark-Sztainer, Story, Jeffery, Beuhring et al., 2001) and acculturated adolescent Hispanic girls (Strauss, 2000). Prospective longitudinal studies have shown that poor self-esteem and depression intensify among overweight youth from childhood to adolescence (Strauss). Victimization is not the only characteristic of psychosocial disturbance; during adolescence, overweight youth are also more likely to be perpetrators of bullying behaviors (Janssen, Craig, Boyce, & Pickett, 2004). Although depression, poor self-esteem, alienation, and bullying behaviors are associated with being overweight, it is unclear whether obesity is an antecedent or consequence of these psychosocial conditions (Goodman & Whitaker, 2002; Mustillo et al., 2003). It is also unclear whether these associations will change with the increased prevalence of youth who are overweight.

Many researchers identify anti-fat biases and sociocultural influences as the catalyst for lower subjective well-being in those who are overweight (Berger, 2004). There is a consistent negative bias toward people who are overweight, even among health professionals (Puhl & Brownell, 2001; Schwartz et al., 2003). In a study examining anti-fat stereotypes among white non-Hispanic 9-year-old girls and their parents, a general trend to attribute positive characteristics to thin people and negative characteristics to obese people was found, regardless of whether the girls or their parents were overweight (Krahnstoever-Davison, Francis, & Birch, 2005). Fathers who were more highly educated and had higher incomes had greater anti-fat stereotypes, and mothers and fathers who placed a higher importance on physical appearance had greater anti-fat stereotypes. Girls were more likely to endorse anti-fat stereotypes when their parents encouraged them to lose weight and when their peers focused on body weight and shape.

More research is needed to identify the extent to which the psychosocial correlates of physical activity , including perceptions of parental and peer influence, may be affected by being overweight.. The negative evaluations may result in a further decrease in physical activity rather than serve as motivating factors. Conversely, with the increased prevalence of youth overweight, there may be fewer negative psychosocial consequences due to the "normal" condition of overweight.

Finally, these associations must also be considered within the unique culture of the community. Further work is particularly needed to identify the possible interactions between self-perceptions, psychosocial correlates, and the unique social ecological environment of different areas of the country. Descriptive statistics may define the extent of the problem, but examining the mediating and moderating effects of being overweight may provide more information on how to address the problem of youth inactivity.

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CHAPTER 2

RURAL–URBAN DIFFERENCES IN YOUTH PHYSICAL ACTIVITY, PHYSICAL FITNESS, AND OVERWEIGHT PREVALENCE

A manuscript to be submitted for publication in the *Journal of Rural Health*

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Abstract

Background: The increasing prevalence of youth who are overweight is one of the most pressing public health problems facing the country and increasing physical activity is essential to reverse this trend. Large-scale examination of rural-urban differences may provide important information regarding targeted physical activity interventions. **Methods:** Participants included rural and urban children (1687 boys; 1729 girls) from grades 4–6. Multi-level modeling analysis was used examine rural–urban differences in physical activity, aerobic physical fitness, and prevalence of overweight. Physical activity was assessed by self-report, physical fitness was assessed by the PACER shuttle run or mile run, and body mass index was calculated from measured height and weight. **Findings:** Urban children were the least active overall (Cohens' d = -0.4), particularly around lunch time while at school (d = -0.9 to -1.1). Rural children reported the least activity during physical education class (d = -0.2). Urban boys showed significantly lower levels of physical fitness compared to boys from rural areas and small cities (d = -0.5). Prevalence of overweight was higher among rural children (25%; $P < .001$) than children from urban areas (19%) and small cities (17%). **Conclusions:** The results of this study suggest there are rural-urban differences in children's physical activity, aerobic physical fitness and prevalence of overweight even within a fairly homogenous Midwestern state.

Introduction

The epidemic of youth obesity[i] is one of the most pressing public health problems in the United States[1] and is related to reduced physical activity. School physical education time has decreased since 1990 and children today are also less likely to walk to school or play outdoors in their free time.[2] Reversing the decline in youth physical activity is a key component to halting the obesity epidemic.

An '*obesigenic*' environment that impedes physical activity has been implicated as a major contributing factor in the obesity epidemic.[3-5] Broad social ecological approaches to the promotion of physical activity are widely recognized as the most effective approaches to altering the complex social and environmental factors that influence this epidemic.[6-9] It is also recognized that more targeted interventions for specific subpopulations are needed to maximize the potential for success in interventions to increase physical activity.[10] Thus, examining specific subpopulations within a social ecological approach is clearly needed.

Although the association between physical activity and social factors such as gender and race/ethnicity have been widely examined, ecological factors such as geographical differences have received less attention, particularly within the homogenous population of the Midwest. Nationally, adults in rural areas have been shown to have a higher incidence of physical inactivity and obesity than adults in urban settings.[11] In addition, higher rates of obesity have been reported for adults in rural areas in the Third National Health and Nutrition Examination Survey (NHANES III). These results may seem counter-intuitive based on the belief of the high physical demands of rural life but may be reflective of the changing nature

[i] The Centers for Disease Control and Prevention recommend the use of the word "overweight" rather than "obesity" to describe excess weight, to minimize the potential of negative labeling for youth. "Overweight" will be the common terminology used in this manuscript, except in cases where authors have specifically used the term "obesity."

of rural life.[12] Rural life does not necessarily encompass physically demanding tasks anymore, and is a factor in the higher incidence of obesity in rural areas.

Although data on rural adults has been fairly consistent, data on rural *youth* are sparse or concentrated in regions such as the Southeastern United States. One study in the Midwest concluded that rural youth were less active than urban youth.[13] A study of Mississippi youth showed 54 percent of a rural sample were overweight or at risk for being overweight[14]—values which are considerably higher than the national overweight prevalence of 30% for overweight and at risk for overweight.[15] Rural Mississippi youth also reported lower physical activity levels than a comparison national sample, although geographic settings for the national sample were not specified.[14] In contrast, no differences in physical activity were reported in studies comparing youth of rural and urban residence in North Carolina, although differences were noted in the obesity and cardiovascular risk factor profiles.[16,17] A study of girls in South Carolina also reported no differences in activity levels by geographical setting.[18]

The inconsistent nature of these studies may be due, in part, to confounding by other variables. A review of research on rural–urban differences indicated that the higher prevalence of obesity in rural areas may be attributed to the lower socioeconomic status (SES) of rural populations.[19] The fact that physical inactivity has been similarly associated with low SES in children[20] indicates that this is a variable that needs to be considered when examining rural--urban differences.

The Midwest has the largest land mass allocated to agriculture in the United States, but little information is available on the activity patterns or prevalence of obesity of urban and rural youth in this part of the country. The present study employs multi-level modeling analysis[21] to examine urbanization influences on physical activity, aerobic physical fitness, and the prevalence of being overweight in a large sample of elementary school children in the Midwestern state, Iowa. Iowa is typically considered to be a rural state although there are areas of urbanization. The use of multi-level modeling accounts for individual school differences; therefore, possible geographic differences are shown more clearly.

Methods

Participants

The sample included 3,416 Iowa children (1687 boys; 1729 girls) from grades 4 (n = 1243), 5 (n =1119), and 6 (n = 1054). The mean age of the participants was 10.6 $\pm$ 0.96 years (range: 8–13 years). Data were obtained from the Physical Activity and Nutrition Among Rural Youth (PANARY) project, a large statewide study aimed at understanding the unique needs of rural youth. A total of 41 elementary schools participated in the project during the 2003/2004 school year and these schools were distributed in 21 (of 99) different counties, representing diverse geographical areas in the state. The level of urbanization was determined by county Beale codes, which distinguish metropolitan counties by size and non-metropolitan counties by degree of urbanization and proximity to metro areas.[22] In this study, codes of 0–2 defined large urban areas, a code of 3 defined metropolitan areas identified in this study as “small cities” (population less than 250,000 in the county), and codes of 4–9 defined rural areas. Parental consent was obtained for all participants prior to testing. The Institutional Review Board at Iowa State University approved the instruments and procedures used in the study.

Measures

<u>Physical Activity</u>

Physical activity was assessed using the Physical Activity Questionnaire for Children–PAQ-C.[23,24] This instrument assesses a child's self-report of typical level of activity in different settings and different times of the day (e.g., PE class, activity at lunch, activity on the weekend). Each of the 9 questions is scored on a 1-5 Likert-type scale and the average is used to represent the activity level of the child. The PAQ-C has been shown to have adequate test-retest reliability (range: r = .75–.82) and reasonable validity (range: r = .45–.53) when compared against objective measures of physical activity.[25] Past studies have also supported its use as a measure of physical activity in youth.[26,27]

This study was unique in that differences in the individual items of the PAQ-C were analyzed. It was determined that an analysis of the individual items related to different settings and different times of the day would further inform future intervention programs.

Physical Fitness

Aerobic physical fitness was assessed using either the PACER aerobic shuttle run[28] or the mile run. Research has demonstrated that the two tests yield similar estimates of aerobic capacity in middle school youth so the use of data from both measures is appropriate.[29] Oxygen consumption (VO_2 in $ml \cdot kg^{-1} min^{-1}$) was calculated using prediction equations associated with the respective field tests.[30] The tests were administered by trained physical education teachers who had been participating in the PANARY project for several years. Teachers in the project received training on the use of the *FITNESSGRAM*[31] youth fitness assessment battery and conduct standardized fitness evaluations on their students each year.

Measure of Body Mass Index

Height and weight of the students were measured by trained physical education teachers. Children were attired in light-weight gym clothes without shoes for this assessment.

Body mass index was calculated from measured height and weight. *BMI-for-age* percentiles were calculated on the basis of the 2000 Centers for Disease Control and Prevention (CDC) charts. According to definitions set by the CDC, youth with a BMI ≥85th percentile but < 95th percentile are considered to be "at risk for overweight." Youth with BMI above or equal to the 95th percentile are categorized as "overweight." Youth with a BMI below the 85th percentile are categorized as "normal weight."

Analysis

Descriptive statistics including means and standard deviations (*SD*) were calculated by gender and grade level of participants. Initial results showed no significant differences by grade; therefore data from all 3 grades were combined with age entered as a covariate. Because of the nested nature of the data (individuals within schools), preliminary analyses were conducted to determine the appropriate analysis strategy to examine gender and urbanization level effects. Intraclass correlation coefficients (ICC) were computed to determine the degree of school-level clustering. The ICC values were $r > .01$ for the PAQ-C and VO_2 variable, indicating that school units accounted for variability of sufficient magnitude in the sample to warrant multi-level modeling.[32] The following model was utilized to determine gender and level of urbanization effects:

$$Y_{ij} = \beta o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_{23} X_{23} + \zeta + \varepsilon_i$$

where, Y_i = outcome variable (PAQ-C; VO_2), β_o = overall mean, $\beta_1 X_1$ = individual school effect, $\beta_2 X_2$ = gender main effects, $\beta_3 X_3$ = level of urbanization main effects, $\beta_{23} X_{23}$ = gender by level of urbanization interaction, and $\zeta + \varepsilon_i$ are school unit and individual level error terms (which are assumed to be normally distributed with zero means with Y as the observation on the i gender at the j level of urbanization). The advantage of these models are that the crosslevel interaction between variables that occur at different levels of aggregation can be examined.[33]

Mixed modeling analyses that control for school level effects were conducted on the outcome measures of physical activity and aerobic physical fitness to test for differences across gender and grade level. The present study was targeted an age group (upper elementary students), but specific age within that category was not a variable of interest, thus was entered as a covariate. Weight in kg is used as the denominator in calculating VO_2, thus BMI was entered as a covariate for the analysis of the physical fitness variable. Statistical tests were conducted with F values adjusted for clustering. The alpha level was set at 0.05 for these comparisons. Cohen's d effect sizes were reported for the significant differences [$d = (M_i - M_j)/SDpooled$] to indicate the magnitude of the differences.

Results

Seventeen percent of the children were from urban areas, 54% were from small cities, and 30% were from rural areas. Ethnicity was not tracked at the individual level, but the overall school-level distributions were similar across the three regions and similar to overall distributions in the state (~90% White). Ethnicity was not appreciably correlated with physical activity ($r = -0.04$), VO_2 ($r = -0.08$), BMI ($r = .04$), or SES ($r = .05$) although all of the values were statistically significant at $P < .05$. Socioeconomic status was estimated at the school level by the percentage of students eligible for free or reduced-cost lunches. The percentage of students eligible for free and reduced-cost lunches was highest in rural areas (40%), followed by small cities (24%) and urban areas (18%). Socioeconomic status was positively correlated with the Beale Code ($r = 0.51$; $P < .01$), indicating that lower SES was associated with rural areas.

Descriptive statistics (using unadjusted means) for physical activity, aerobic physical fitness, and BMI are provided in Table 2.1. Table 2.2 shows the classification of aerobic physical fitness (based on *FITNESSGRAM* Healthy Weight Zones; a criterion variable for aerobic fitness rather than percentile) and weight (e.g., normal weight, at-risk for overweight, overweight) by level of urbanization. The alpha reliability coefficients indicated acceptable internal consistency for the PAQ-C scale with a value $\alpha = 0.72$.

Physical Activity

Urban children were the *least* active [$F(2,3477) = 33.28$, $P < .01$], although effect sizes were small to moderate ($d = -0.43$). Children from small cities reported a slightly higher PAQ-C than rural children. Boys were more active than girls [$F(1,3477) = 25.4$, $P < .01$; $d = 0.15$] and these gender differences did not vary by location. See Figure 2.1 for the differences in physical activity by gender and level of urbanization.

The largest difference in total physical activity (accounting for 10.8% of the variance) was due to less "around lunchtime activity" reported by urban children (mean PAQ = 1.0 +/- 0.3) as compared to children from small cities (mean PAQ = 2.4 +/- 1.6; $d = -0.9$) and rural areas (mean PAQ = 2.5 +/- 1.7; $d = -1.1$). Urban children also reported less activity after school and in the evening than children from small cities and rural areas (significant differences at 95% CI only for urban boys in the evening), but there were no differences in physical activity during the weekend. Rural children reported the least activity during physical education class ($d = -0.22$). Table 2.3 shows the differences in physical activity at specific times of the day.

Physical Fitness

Children from small cities had the highest levels of aerobic physical fitness (VO_2 in $ml·kg^{-1}min^{-1}$; $d = 0.34$), although rural boys areas showed similar levels ($d = -0.11$). Boys had higher fitness values than girls in small cities and rural areas [$F(1,2108) = 79.5$; $P < .01$; $d = 0.38, 0.45$], however, urban boys and girls did not differ from each other at the 95% CI [$F(2,2108) = 37.6$, $P < .01$; $d = 0.08$]. A higher percentage of children from small cities (90%) achieved the *FITNESSGRAM* "Healthy Fitness Zone"[ii] compared with urban (82%) and rural (82%) children. See Figure 2.2 for differences in aerobic physical fitness by gender and level of urbanization.

Body Mass Index

Rural children had a higher mean BMI [$F(2, 2734) = 12.9$, $P < .01$] than children from small cities or urban areas, but this difference was significant at the 95% CI only for rural boys. The BMI of boys and girls did not differ significantly, and these small gender differences did not vary between geographical areas. Prevalence of overweight was higher among rural children (25%, $P < .001$) than children from urban areas (19%) and small cities (17%). See Figure 2.3 for BMI by gender and level of urbanization.

Discussion

This is the first known study to examine levels of physical activity, aerobic physical fitness, and BMI by level of urbanization in a large sample of Iowa children. The study extends previous research by examining an under-studied region of the country and by utilizing multi-level modeling techniques. The results of this study suggest that there are differences in children's physical activity, aerobic physical fitness, and prevalence of overweight by level of urbanization even within a fairly homogenous Midwestern state.

With respect to physical activity, rural children were *more* active than urban children. Previous inconsistencies in findings related to geographic differences in physical activity may be explained by differences in the samples and measures. In the studies reporting lower physical activity levels among rural youth[13,14] control groups were not used; rather, conclusions were drawn by extrapolation from previously reported data. Studies directly comparing rural and urban children of the same region at the same time did not show differences in physical activity. [16, 17] In addition, low family SES (which is prevalent in rural areas) has been associated with lower levels of activity.[19] In the present study, the rural sample had lower levels of SES (40% of the students were eligible for free or reduced-cost lunches, e.g., household income < 185% of poverty level or $14,000 for a family of three) but were still more active than the urban children (18% of the students were eligible for free or reduced-cost lunches). The higher prevalence of lower SES among rural Mississippi youth[14] (76% were eligible for free or reduced cost lunches) may have played a greater role than level of urbanization in that study.

An advantage of the present study is that differences in time and location of physical activity were explored by examining individual items on the PAQ-C. Children from small cities reported a slightly greater frequency of activity during physical education time and after school compared to urban and rural children, and this likely contributed to their higher overall level of physical activity. The greatest difference in physical activity among urban children as compared to children from small cities and rural areas was less activity around lunch time while at school. Physical activity levels were similar for children from all locations on the weekends. Similar to results reported for other regions of the country, gender disparities were apparent as girls were less active than boys at all ages and in all locations.

The smaller difference between girls and boys in the urban sample may have been due to a floor effect, in that the scores were generally low for this group.

With regard to fitness, we observed that cardiovascular fitness was highest in children from small cities but no differences were evident between urban and rural children. Based on the *FITNESSGRAM*[28] criterion-referenced standards, approximately 90% of children in small cities scored in the Healthy Fitness Zone (HFZ). In contrast, 82% of rural and 82% of urban children scored in the Healthy Fitness Zone. Overall, the mean calculated oxygen consumption level of boys was 45.8 ± 6 ml·kg^{-1}min^{-1} and girls was 43.5 ± 5 ml·kg^{-1}min,$^{-1}$ based on the results of the PACER test or mile run, A study of similarly aged Iowa children using measured oxygen consumption, reported slightly higher oxygen consumption levels for boys (49 ml·kg^{-1}min^{-1} $\pm$ 8) but slightly lower values for girls (40 ml·kg^{-1}min^{-1} $\pm$ 7).[35]

The higher prevalence of overweight among rural children (25%) was consistent with results found in other regions of the country.[11,13,14] All three groups showed a higher prevalence of being overweight than the national average of 16% for this age group.[15] Overall prevalence for overweight *and* at risk for overweight was 40%, and this is considerably higher than the national average of 30% for similarly aged children[15] and higher than the 25.5% for Iowa youth reported in the 2003 National Children's Health Survey. However, both the national and state averages for the prevalence of overweight were based on parent-reported height and weight rather than measured height and weight, which may explain the discrepancy.

Children who are overweight often have high blood pressure and high cholesterol and are more likely to become overweight adults.[36,37,38] Studies showing the potential long-term risks of childhood overweight did not investigate physical activity as a possible moderating variable on the health risks of being overweight. Mc Murray et al.[16], utilizing statistical techniques to adjust for clustering, found that rural children had higher levels of obesity, but *not* lower levels of physical activity nor increased number of risk factors such as total cholesterol and blood pressure. Those results suggested increased physical activity provided a protective effect for overweight youth.

The interactions among physical activity, aerobic physical fitness, and being overweight are clearly complex in children and adolescents. Adding to the complexity is conflicting data regarding the influence level of urbanization may have on these outcomes. The results of this study suggest modest but significant differences in physical activity, aerobic fitness, and overweight by levels of urbanization in a large sample of elementary school children. However, there are also limitations in the study that should be considered when interpreting the results.

At first glance, the results may appear contradictory given that rural children had higher levels of physical activity than urban children, yet had a higher prevalence of being overweight. Overweight is a combination of energy expenditure (including physical activity) and energy intake, and the present study did not address dietary habits, which would have allowed for further exploration of this issue. Second, the scope of the study necessitated the use of a self-report measure of physical activity. The use of accelerometry-based activity monitors would have provided a more objective measure of physical activity but was outside the scope of the study.

Although an objective measure of physical activity may have allowed a determination of whether children are meeting established physical activity guidelines, the factorial nature of the PAQ-C instrument provided some unique advantages. The main advantage is that times and settings were included in the survey that helped explain rural and urban differences between overall activity levels in our sample.

A third potential limitation was that the scope of the project necessitated that the data on fitness and BMI be obtained by the physical education teachers in the schools rather than by the research staff. However, the teachers did receive training in the proper administration of the *FITNESSGRAM* assessments. The use of the established *FITNESSGRAM* test protocols and the experience of the teachers with the *FITNESSGRAM* program likely reduced the chance of systematic bias in the fitness data.

Despite these limitations, the results indicate the potential for several future targeted physical activity interventions. For example, providing physical activity opportunities around lunch time may be an effective strategy for increasing the physical activity of urban children, whereas increasing physical activity during physical education time and after school may be more important for rural children. Further research with objective physical activity measures could be used to evaluate these suggestions for targeted interventions.

The American Academy of Pediatrics Association issued a landmark policy statement encouraging parents, pediatric health care providers, and public health officials to advocate for increased physical activity for children and teenagers at home, school, and in the community as a major thrust to combat obesity.[39] Interventions need to be uniquely tailored to the ecological settings of each subpopulation. Knowledge of differences in rural and urban areas of the Midwest may help expedite those processes. A socio-ecological framework involving children, families, schools, and their communities would help to implement programming to address the unique needs of these populations.

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Table 2.1

Comparison of Unadjusted Means ± SD for Physical Activity, Physical Fitness, and BMI by Gender and Level of Urbanization

Variables	Urban		Small Cities		Rural	
	Boys	Girls	Boys	Girls	Boys	Girls
Physical Activity (PAQ-C)[a]	3.0 ± 0.9	2.8 ± 0.9	3.3 ± 0.9	3.1 ± 0.9	3.2 ± 0.9	3.1 ± 0.9
Physical Fitness (VO_2 in ml kg^{-1} min^{-1})[b]	45.2 ± 4.6	44.6 ± 4.5	47.6 ± 5.5	45.7 ± 4.5	45.8 ± 5.9	43.5 ± 4.1
Body Mass Index (kg·m^2)[c]	20.2 ± 4.2	19.5 ± 3.9	19.7 ± 4.1	20.0 ± 6.7	21.3 ± 5.5	20.7 ± 4.6

[a]PAQ-C; 1 = no physical activity, 5 = high amount of physical activity. [b]Physical fitness (VO_2 in ml·kg^{-1}min^{-1}) estimated from PACER or mile test. [c]Body mass index (kg·m^2) calculated from measured height and weight

Table 2.2

Physical Fitness and BMI-for-Age Classifications by Gender and Level of Urbanization

Variables	Urban	Small Cities	Rural
Physical Fitness[a]			
Healthy Fitness Zone	82.0%	90.3%	81.8%
Non-Healthy Fitness Zone	18.0%	9.7%	18.2%
Body Mass Index-for-Age Classifications[b]			
Normal weight	62.8%	62.9%	53.1%
At-Risk for Overweight	17.8%	19.5%	21.8%
Overweight	19.4%	17.6%	25.1%

[a]$\chi^2 = 51.6$; $df = 4$; $P < .001$. [b]$\chi^2 = 26.1$, $df = 4$; $P < .001$

Table 2.3

Physical Activity (PAQ-C)[a] Unadjusted Means ± SD by Gender and Urbanization

PAQ Variables	Urban		Small Cities		Rural	
	Boys	Girls	Boys	Girls	Boys	Girls
PE class	4.3 ± 0.9	4.2 ± 0.9	4.3 ± 0.8	4.3 ± 0.9	4.1 ± 0.9	3.9 ± 1.1
Around lunch time	1.1 ± 0.4	1.0 ± 0.2	2.5 ± 1.7	2.3 ± 1.6	2.7 ± 1.8	2.3 ± 1.5
After school	3.4 ± 1.4	3.3 ± 1.2	3.7 ± 1.4	3.4 ± 1.3	3.5 ± 1.3	3.3 ± 1.3
Evening	3.2 ± 1.3	3.1 ± 1.1	3.4 ± 1.2	3.3 ± 1.2	3.4 ± 1.2	3.3 ± 1.2
Weekend	3.7 ± 1.2	3.6 ± 1.1	3.6 ± 1.2	3.4 ± 1.2	3.6 ± 1.2	3.5 ± 1.2
Screen time	3.8 ± 1.4	3.6 ± 1.3	3.7 ± 1.4	3.4 ± 1.3	3.6 ± 1.5	3.4 ± 1.4

[a]PAQ-C: Physical Activity Questionnaire for Children is on a scale of 1 (*No Activity*) to 5 (*Very Active*).

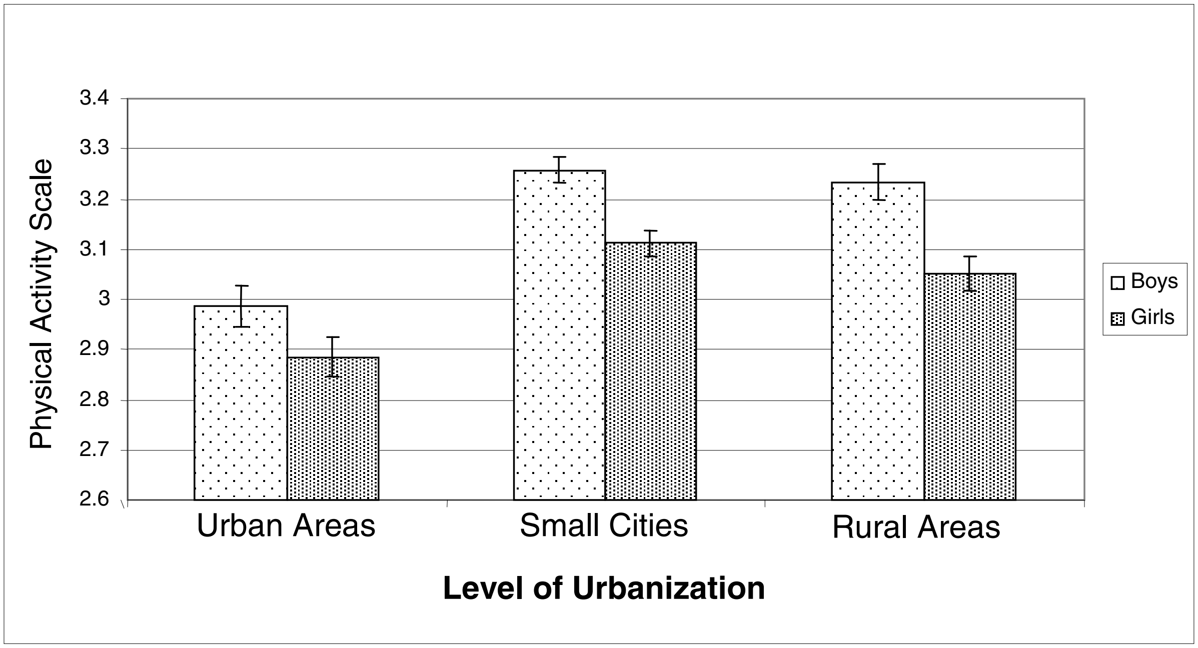

Figure 2.1. Physical activity levels by gender and level of urbanization. Physical Activity Questionnaire for Children (PAQ-C) is on a scale of 1 (*No Activity*) to 5 (*Very Active*) with standard error bars.

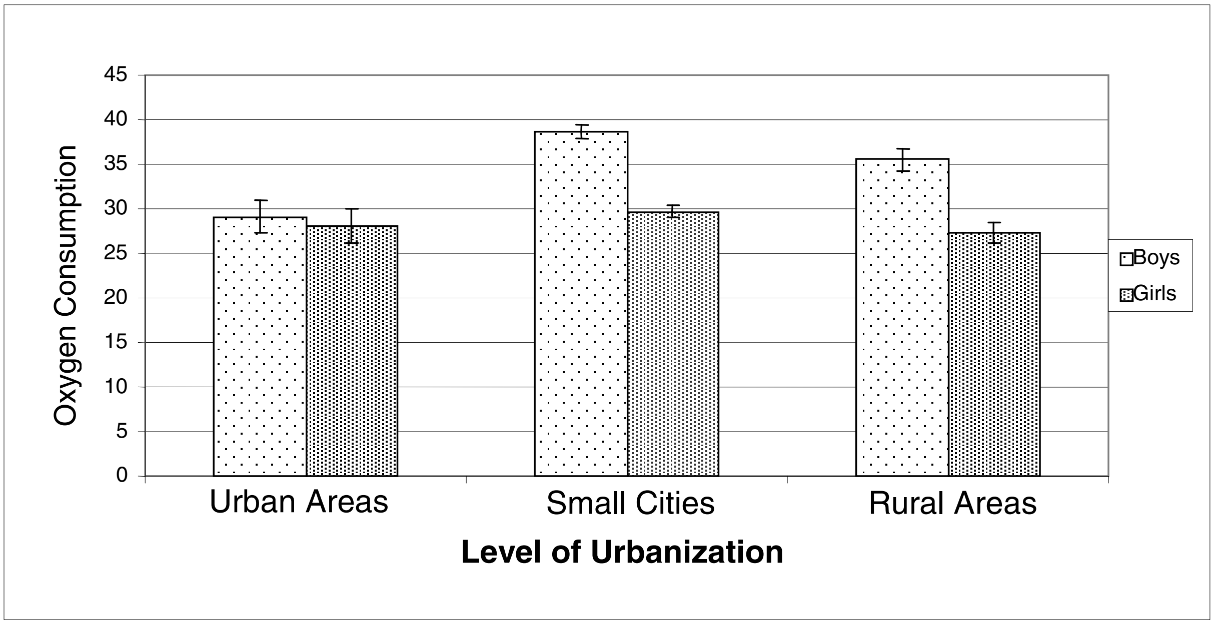

Figure 2.2. Aerobic physical fitness by gender and level of urbanization. Oxygen consumption (VO_2 in ml·kg^{-1}min^{-1}) with standard error bars estimated from the PACER or mile test.

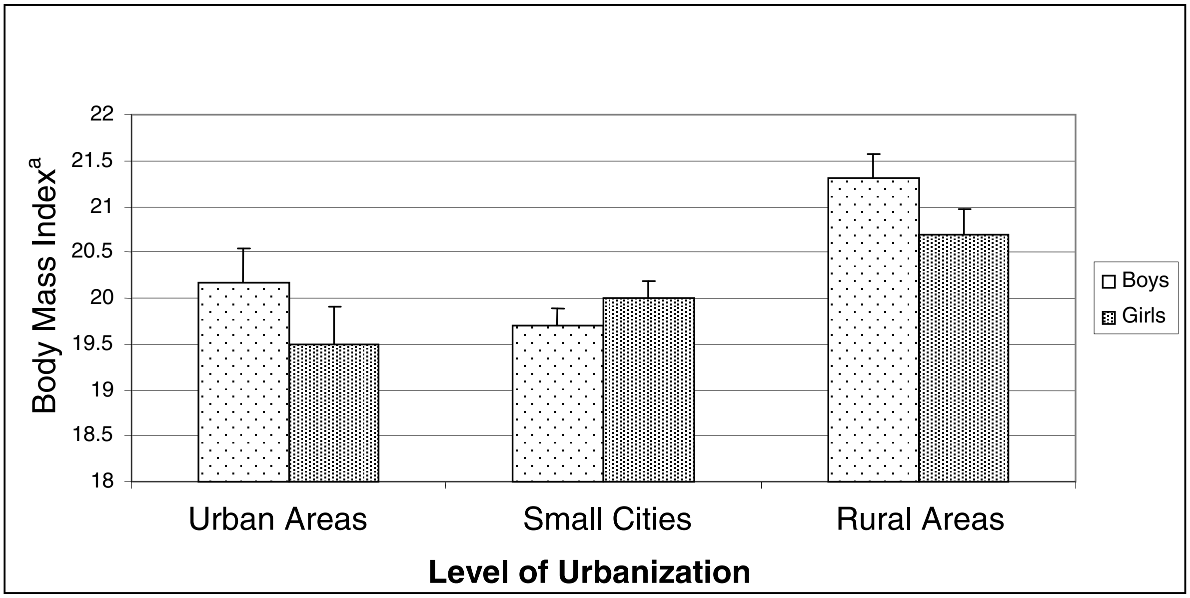

Figure 2.3. Body mass index by gender and level of urbanization. Body Mass Index (kg·m^2) with standard error bars.

CHAPTER 3

CONFIRMATORY FACTOR ANALYSIS OF THE CHILDREN AND YOUTH PHYSICAL SELF-PERCEPTION PROFILE WITH OVERWEIGHT YOUTH

A manuscript prepared for submission to *Body Image*

R. R. Joens-Matre, G. J. Welk, & D. W. Russell

Abstract

Introduction: Physical self-perceptions are related to physical activity and self-esteem in adolescents. A measurement tool that is particularly suited to investigating how youth perceive their physical self is the Children and Youth Physical Self-Perception Profile (CY-PSPP). The CY-PSPP has been validated with high school athletes, middle school youth, and elementary school youth, but no research to date has examined if the profile works well for adolescents. Furthermore, no studies have examined whether the CY-PSPP shows factor invariance across weight status.

Purpose: The purpose of this study was to examine the factor structure of the CY-PSPP with adolescents across weight status. A secondary purpose was to compare physical self-perceptions of OAR and NW adolescent boys and girls and to examine the hierarchical relationships of those perceptions with physical self-worth and self-esteem.

Methods: A total of 521 high school students (204 boys; 317 girls) volunteered to participate in the study. Height, weight, and body composition were assessed. Students completed the CY-PSPP, physical activity, and self-esteem surveys. Confirmatory factor analysis of the CY-PSPP and structural modeling of the relationships among the CY-PSPP factors were performed using LISREL 8.7. Weight categories were determined by body composition.

Results: Confirmatory factor analysis indicated that the hypothezised factor structure of the CY-PSPP provided adequate fit to the data for both genders (Comparative Fit Index = .97-.98) and across weight groups for girls (Comparative Fit Index = .96 - .97). Overweight youth reported significantly lower physical self-perception scores than normal weight youth with large differences (Cohens' $d = 0.74 – 1.16$).

Conclusions: The CY-PSPP instrument showed adequate fit to the data by gender and by weight status in girls, further validating its use with an increasingly overweight youth population. The results clearly show more negative self-perceptions of physical self-worth and self-esteem,of overweight youth than normal weight youth.

Introduction

The health implications of obesity have received considerable attention in both the scientific and lay literature, but there is comparatively little known about the psychosocial ramifications of the changing shape of our society. Youth obesity is associated with stigmatization and negative psychosocial conditions including alienation and poor self-esteem, which can lead to depression and other negative health outcomes (Strauss & Pollack, 2003; Williams, Wake, Hesketh, Maher, & Waters, 2005). These untoward effects seem to particularly impact white adolescent girls (Faulkner, Neumark-Sztainer, Story, Jeffery, Beuhring, & Resnick, 2001) and acculturated adolescent Hispanic girls (Strauss, 2000).

Physical self-perceptions can influence self-esteem and are important psychosocial correlates in the relationship between being overweight and physical activity (Sonstroem, 1997). In one study of adolescent girls, physical self-perception was a more important predictor of physical activity than body mass index (Crocker, Sabiston, Forrestor, Lowalski,

& Mc Donough, 2003). Poor physical self-perception may decrease motivation to be physically active (Biddle & Mutrie, 2001).

A measurement tool that is particularly suited to investigating how youth perceive their physical self is the Children and Youth Physical Self-Perception Profile (CY-PSPP; Welk, Corbin, & Lewis, 1995; Whitehead, 1995). It is based on the original Physical Self-Perception Profile (PSPP) designed for college students and young adults to study the factors that comprise a person's perception of his/her physical self (Fox & Corbin, 1989). Fox and Corbin presented evidence that the four factors measured by the PSPP are related to a person's sense of physical self-worth: body attractiveness, sport/athletic competence, strength competence, and physical conditioning adequacy. Physical self-worth, in turn, is related to a person's global self-esteem (Sonstroem & Morgan, 1989). Sonstroem (1997) cited the PSPP as a "major advance" in capturing the multi-dimensional and hierarchical nature of physical self-worth. The PSPP sub-domains have a taxonomic quality as well, with items representing categories of product, process, and perceived confidence for each subscale (Marsh, 1997).

Revised wording of the scale for youth was initially proposed by Whitehead (1995) and further modified to become the current version of the CY-PSPP (Eklund, Whitehead, & Welk, 1997). This version has been validated with high school athletes (Welk, et al., 1995), middle school youth (Eklund et al.; Whitehead, 1995), and elementary school youth (Welk & Eklund, 2005), but no research to date has examined if the instrument works equally well for overweight and normal-weight youth. Previous research with high school youth used a sample of young athletes, so it is important to examine the validity with a more representative sample of the population. Extending the validation study of the CY-PSPP to a representative adolescent sample, including overweight youth, will provide a more appropriate validation of the CY-PSPP.

Cohen, Scribner, and Farley (2000) have stated that “if the prevalence of high-risk behaviors in the selected population is high, and the goal is to influence as many persons as possible who are practicing the high-risk behavior, then a structural approach is warranted” (p. 152). When prevalence of overweight and at-risk for overweight among youth was relatively low, individual level analysis of psychosocial correlates of physical activity would likely be sufficient to characterize the population. However, with the prevalence of overweight and at-risk for overweight so high among youth, it becomes important to heed the advice of Cohen et al. (2000) and examine possible differences in the model between strata defined by overweight status.

The purpose of this study was to examine the psychometric properties and the factor structure of the CY-PSPP by gender and weight status of adolescents. A secondary purpose was to compare the physical self-perceptions of overweight and normal-weight adolescent boys and girls and to examine the hierarchical relationships of those perceptions with physical self-worth and self-esteem. Relationships of physical self- perceptions with physical activity and body composition are also examined.

It is hypothesized that the same psychometric properties and factor structure will be evident for overweight and normal-weight youth. It is also hypothesized that overweight adolescent girls will have lower physical self-worth and self-esteem than NW adolescent girls and boys. Determining the factor structure of CY-PSPP for these diverse groups will provide evidence as to the validity and utility of the scale to inform future intervention research, particularly for overweight adolescent youth.

Methods

Students (grades 10–12) were initially recruited during physical education classes in a large Iowa suburban high school. Approximately 61% of the eligible students participated in the study (it is not known how many of the 860 students enrolled in the classes may have been missing or had dropped the class). The classes were composed primarily of sophomores. A total of 521 high school students (204 boys and 317 girls; mean age 16.3 $\pm$ 1 years) volunteered to participate in the study. Anthropometric data from 63 students were not matched to the surveys; therefore, thus those data were not included in the study. The investigator described the measurements, surveys, confidentiality, and voluntary nature of the study in all of the physical education classes on the selected day. Students were advised to be well-hydrated for the bioelectrical impedance measurement and to wear lightweight clothing. Students and parents were allowed a period of one week to examine the documents and sign the informed consent/assent prior to data collection. The Iowa State University Institutional Review Board approved the instruments and procedures.

Physical Measures

Overweight indicators included measurements of body size and composition. *Stature* was measured to the nearest 0.1 cm using a stadiometer. The participant stood upright without shoes, with weight distributed evenly between both feet, heels together, arms relaxed at the sides, and with the head in the Frankfort horizontal plane. *Body mass* was measured on an electronic scale to the nearest 0.1 kg with the participant attired in gym shorts and T-shirt without shoes. *Body mass index (BMI)* was calculated from stature and body mass ($kg \cdot m^2$). A measure of body composition (percent body fat) was also obtained to provide a more precise indicator of overweight and obesity. *Body composition* was assessed with a hand-held bioelectrical impedance analyzer (BIA; Omron). This device provides a reliable and valid assessment of body fatness in less time than is required for skinfold testing (Houtkooper, Lohman, Going, & Howell, 1996; Swartz, Evans, King, & Thompson, 2002). Past research has demonstrated good agreement between the BIA measure and skinfold tests (Houtkooper, et al., 1996).

BMI-for-age percentiles were calculated on the basis of the 2000 Centers for Disease Control and Prevention (CDC) charts (Ogden, et al., 2002). According to definitions set by the CDC, youth with a BMI ≥85th percentile but < 95th percentile are categorized as "at risk for overweight" which is similar to the "overweight" BMI category of adults. Youth with BMI above or equal to the 95th percentile are categorized as "overweight" which is similar to the "obese" category in adults. This nomenclature is designed to mitigate the negative psychosocial effects of the label "obese" for youth.

Body fat percentage provides a more accurate indicator of excess adiposity than BMI (Houtkeeper et al., 1996). Due to the greater accuracy of body fat analysis in detecting excess adiposity, normal weight and overweight status were determined by percent body fat for all analyses to reduce the misclassification of youth due to stature or lean body mass. Adverse health effects of obesity are associated with a body fat percentage >25% for boys and >32% for girls (Freedman, Dietz, Srinivasan, & Berenson, 1999), but there are not established guidelines for a recommended body fat percentage in youth. Based on the concept of the "at risk for overweight" category of BMI, boys' normal weight (NW) status was defined as <18% body fat, whereas girls' normal weight was defined as <25% body fat (these cut points are the midpoints of the recommended body fat range listed in the *FITNESSGRAM* guidelines). Youth with body fat percentage higher than those cut points were categorized as "overweight/at risk for overweight" (OAR). The use of 25% body fat as a cut point of at risk for overweight for girls also allowed an adequate sample size (n =131) for use in the confirmatory factor analysis.

Surveys

Physical Activity Questionnaire for Adolescents (PAQ-A). The PAQ-A (Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997; Kowalski, Crocker, & Faulkner, 1997; Kowalski, Crocker, & Kowalski, 1997) is designed to evaluate an adolescent's activity based on a series of 9 questions that assess activity habits at different times of the day (e.g., PE class, activity at lunch, and activity on the weekend). Each question is scored on a 1-4 Likert-type scale and the average of all 9 items is used to represent the activity level of the adolescent. The PAQ-A has shown adequate test-retest reliability (range: r = .75–.82), acceptable internal consistency (α = .80), and reasonable validity (range: r = .45–.63) when compared against other objective measures of physical activity (Crocker et al., 1997; Kowalski & McGrath, 1997; Kowalski, Crocker, & Faulkner, 1997). See the Appendix for a complete copy of the questionnaire and codebook.

*Children and Youth Physical Self-Perception Profile (*CY-PSPP). The CY-PSPP (Eklund et al., 1997) is a revised version of the original PSPP developed by Fox and Corbin (1989). The multidimensional 30-item profile includes four 6-item subscales to assess perceptions of body attractiveness (Body), sport competence (Sport; based on Harter's, 1985, competence scale), physical strength competence (Strong), physical conditioning (Cond), and a fifth higher-order scale (meaning that the subscales all influence this more global measure) that captures physical self-worth (PSW). A structured alternative format is used to minimize socially desirable responses (Harter, 1992). Although not a part of the original CY-PSPP, the instrument is typically administered along with Rosenberg's (1965) Self-Esteem scale to allow examination of the hierarchical self-concept structure (Fox, 1998) with global self-esteem (GSE) subsumed by PSW, then the more specific subscales of body attractiveness, sport competence, strength adequacy, and condition adequacy.

Perceived Importance of Body, Sport, Strong, and Condition. The relationship between the subdomain variables with PSW may be influenced by the relative importance an individual places on each variable. Four 2-item scales of perceived importance of body attractiveness (BodyPI), sport athletic competence (SportPI), strength competence (StrongPI), and condition adequacy (CondPI) were included in the survey to test the relationship between the perceived importance of the dimensions and the subsequent loadings on the higher order constructs of PSW and GSE.

Analysis

Psychometric properties of the CY-PSPP were evaluated by examining the internal consistency of the component scales and by the correlations among scores on the subscales. Confirmatory factor analysis using maximum likelihood estimates of the six-factor measurement model of the CY-PSPP and structural modeling of the hypothesized relationships among CY-PSPP factors were analyzed by gender and weight category using LISREL 8.7 (Joreskog & Sorbom, 2005). Cases with missing data points were excluded from the confirmatory factor analysis. Items were constrained a priori to load on their previously established constructs. Latent variable interfactor correlations, standard errors, *t* values, and squared multiple correlations were inspected by gender and weight category. Results of the confirmatory factor analysis were further evaluated by χ^2 test, comparative fit index (CFI: Bentler,1990), and standardized root mean square residual (SRMR). Figure 3.1 presents the conceptual model of the CY-PSPP used to describe the hierarchical nature of the subdomains, PSW, and GSE.

Descriptive statistics for the outcome variables including means and standard deviations were computed by age and gender. Bivariate correlations of the outcome variables with the CY-PSPP subscales and analysis of variance (ANOVA) on the PAQ-A, physical self-worth, GSE, and the four subdomain subscales of the CY-PSPP were conducted to examine the effects of by gender and weight status. A Bonferroni adjustment for alpha inflation due to the multiple comparisons was made for the CY-PSPP variables. Significance was set at alpha = .008 (α = .05/6 subscales). Cohen's *d* was used to calculate effect sizes for the differences between groups.

Results

With 77% percent of the students reporting ethnicity, 85.1% were White (non-Hispanic), 4.1% were Asian, 3.2% were Hispanic, 2.2% African American, 1.1 % Indian, and 3.8% other, including East Indian, Eastern European, and Pacific Islander. The distribution is similar to the overall ethnic distribution in the school (89% White [non-Hispanic], 4% Asian/Pacific Islander, 4% Hispanic, and 3% African American).

Using CDC BMI cut points for weight categorization, 14.2% of boys and 7% of girls were in the "overweight" range; 13.3% of boys and 15.5% of girls were in the "at risk for overweight" range; and 72.5% of boys and 77.5% of girls were in the "normal" weight range. This compares to 72.5% of U.S. youth ages 15–17 in the "normal" weight range (Child and Adolescent Health Measurement Initiative, 2006). Ten percent of boys and 15% percent of girls in this study had body fat percentage in the "obese" range; 23% of boys and 29% of girls were grouped as "at risk for overweight"; and 67% of boys and 56% of girls were categorized as "normal" weight (NW). Youth with a percent body fat in the "at risk or "obese" range were grouped as overweight/at risk for overweight (OAR) for the analyses.

Confirmatory factor analysis showed the CY-PSPP showed adequate fit to the data across the subgroups of adolescent boys, girls, and girls by weight category, further validating its use with an adolescent population. Minimal differences by weight status among girls were shown in the factor structure, providing evidence as to the factor invariance of the scale as the prevalence of youth overweight increases. Physical self-perceptions and GSE were lower among OAR youth, demonstrating the predictive utility of the scale.

Psychometric Properties of CY-PSPP

Tables 3.1 to 3.3 provide results on the internal reliability of CY-PSPP subscales. Manifest (measured) variable inter-correlations are listed below the diagonal, and latent (unobservable) variable correlations are listed above the diagonal where applicable. Chronbach's coefficient alpha reliability of the subscales were $\alpha = .84$ - .92 for the total sample ($\alpha = .80$–.93 for boys, and $\alpha = .86$–.93 for girls). Reliability of the subscales were similar for NW boys ($\alpha = .80$–.93), OAR boys ($\alpha = .82$–.91), NW girls ($\alpha = .86$–.92) and OAR girls ($\alpha = .85$–.91).

Across all groups, the highest manifest variable inter-correlations were between the subscales of PSW and Body ($r = .81$–.86; $P < .001$). Boys showed higher correlations of PSW with Sport ($r = .62$; $P < .001$), Strong ($r = .54$; $P < .001$), and Cond ($r = .62$; $P < .001$) than girls ($r = .44$–.51; $P < .001$); and NW boys showed higher correlations than OAR boys, with particularly large differences between the groups for PSW and Strong ($r = .71$ vs. .56, respectively; $P < .001$). Normal weight and OAR girls showed minimal differences in correlations between PSW and the other CY-PSPP subscales.

Boys showed lower inter-correlations than girls between GSE and the CY-PSPP subscales ($r = .33–.61$; $P < .001$; $r = .41–.72$; $P < .001$, respectively) except Body, which was equivalent. Global Self-esteem was moderately correlated with PSW and Body for both OAR and NW ($r = .49–.60$; $P < .001$) boys. The inter-correlations of GSE with Sport, Strong, and Cond were non-significant for OAR boys. There were minimal differences between NW and OAR girls in the inter-correlations of GSE with the CY-PSPP subscales. Global Self-esteem showed the lowest correlation with Strong for both NW ($r = .43$; $P < .001$) and OAR ($r = .35$; $P < .001$) girls.

Confirmatory Factor Analysis

In addition to the total sample, data from the subsamples of all boys, all girls, NW girls, and OAR girls were used to evaluate the measurement and structural model of the CY-PSPP. The subsample of OAR boys ($n = 53$) was not large enough to be included as a comparison group for these analyses.

The highest latent variable factor correlations were between Body and PSW (.93–.98). Boys showed higher correlations between Body and Sport, Strong, and Cond (.62–.72) than girls (.51–.73). The other CY-PSPP interfactor correlations ranged from .46–.85. Girls showed similar correlations between the latent variables, regardless of weight status. For the NW and OAR girls' samples, correlations were smallest with Strong (.35–.43) but were moderate to large for the other variables (.49–.72). Overweight girls did show lower correlations than NW girls between GSE and the other CY-PSPP subscales (.40–.68 vs .47–.77).

The measurement models including item loadings of the CY-PSPP for the total sample, girls, boys, and OAR girls are presented in Figures 3.2 to 3.5. Mean item loadings on the latent variables were similar for the total sample (λ = .81), girls' samples (all girls: λ = .81; NW girls: λ = .82; OAR girls: λ = .79), but lower for the boys' sample (λ = .71). Factor loadings on the latent variables were all above λ = .40, and error variance ranged from .26 to .77. Squared multiple correlations for factor items were above the recommended .50 except for some of the GSE indicator items (3 of 6 items for boys, 4 of 6 items for OAR girls, and 1 item for NW girls). In addition, Sport item 2 was lower than .5 for all groups.

Table 3.4 shows the results of the Goodness-of-Fit Indices (GFIs) for the measurement and structural models. The χ^2 values for the model in all four subsamples were significant (meaning the model does not fit), however, other fit indices are also evaluated The CFI was greater than .95 for the total sample and the subsamples of boys, girls, NW girls, and OAR girls, indicating adequate fit of the model. The SRMR was .04 for the total sample, boys' subssample, and girls' subsample. Breaking the girls' subsample by weight category showed SRMR values of .06 for NW girls and .08 for OAR girls. Adequate fit indices for all comparison groups (boys, girls, NW girls, and OAR girls) extend validation of the CY-PSPP for adolescents. Non-significant χ^2 differences between the NW and OAR girls (χ^2 = 3.04) for the measurement model supports the factor invariance of the scale across weight status.

The structural model illustrates the hypothesized hierarchical nature of global self-esteem at the apex, under which the higher order construct of physical self-worth is subsumed by perceived body attractiveness, perceived sport competence, strength adequacy, and condition adequacy. Global self-esteem and physical self-worth were identified as endogenous variables in the model, whereas perceptions of body attractiveness, sport competence, strength adequacy, and conditioning adequacy were identified as exogenous variables. The CFI for the model showed adequate fit for all groups, but the RMSR was higher for the girls, NW girls, and OAR girls' subsamples, indicating a poorer fit.

Descriptive Results

Descriptive statistics for the primary outcome variables by age and gender are listed in Table 3.5. Mean BMI was 23.6 $\pm$ 4.5 kg·m^2 for boys and 22.8 $\pm$ 3.6 kg·m^2 for girls, and mean BMI-for-age percentile was 63.1 for boys and 61.9 for girls. Mean body fat was 17.1% for boys (n = 204) and 24.5% for girls (n = 317).

Physical Activity (PAQ-A) by age and gender ranged from 2.3 on (a 5-point scale) to 2.8. Global self-esteem ranged from 3.1 to 3.4, and PSW ranged from 2.6 to 3.3—both of which are higher than the midpoint of the scales. Preliminary ANOVA tests for differences by age, gender, and body composition in the PAQ-A and CY-PSPP variables showed non-significant differences for age; therefore, all ages (15–19) were grouped together for subsequent analyses. There were no significant interactions between age, gender, and body composition groups for any of the variables. Gender is a natural grouping variable, and there were significant differences by body composition as predicted a priori to warrant separate analyses by weight status.

Correlations Among Variables

Bivariate Pearson product-moment correlations of physical activity, BMI, and body composition status with the CY-PSPP subscales (Body, Sport, Strong, Cond, PSW) and GSE are presented by gender in Table 3.6. Body mass index was significantly correlated with percent body fat for both genders, although the correlation was weaker for boys (r = .57; P < .001) than girls (r = .77; P < .001). In boys, BMI was not significantly correlated with any of the variables except PAQ-A (r = -.20; $P < .001$) and Strong (r = .39; $P < .001$), yet percent body fat was negatively correlated with all five subscales of the CY-PSPP (r = -.21 to -.58; $P < .001$) except Strong. Among girls, correlations of BMI with Body (r = -.46; $P < .001$), Cond (r = -.19; $P < .001$), PSW (r = -.36; $P < .001$), and GSE (r = -.15 ; $P < .001$) were small to moderate, but correlations with PAQ-A, Sport, and Strong were non significant. Similar to the boys' data, percent body fat was significantly negatively correlated with all variables for girls (r = -.18 to -.49; $P < .001$). The stronger correlations of study variables with percent body fat provided evidence of the superiority of using that measure for categorization instead of BMI to study physical self-perceptions.

Physical activity was moderately correlated with all five subscales of the CY-PSPP for boys (r = .41–.56; $P < .001$) but less so for girls (r = .26–.49; $P < .001$). Physical activity showed the highest correlation with Sport for boys (r = .56; $P < .001$) and Cond for girls (r = .49; $P < .001$). Physical activity showed a low correlation with GSE in boys (r = .23; $P < .001$) and girls (r = .36; $P < .001$).

Gender and Weight Status Comparisons

Table 3.7 shows the comparison of all CY-PSPP variables and GSE by gender and body composition status. Boys reported higher scores than girls on Body, $F(1, 444) = 11.7$, $P < .001$; Sport, $F(1, 439) = 13.8$, $P < .008$; Strong, $F(1, 444) = 25.9$, $P < .001$; and Cond, $F(1, 441) = 15.6$, $P < .001$. Gender comparisons of NW youth showed moderate effect size differences for Body (d = .61), Sport (d = .59), Strong (d = .56), and Cond (d = .44). Gender comparisons of OAR youth showed no significant differences in Body or Sport, but there were small to moderate gender differences of OAR youth for PSW (d = .31), Strong (d = .45), and Cond (d = .44).

Normal weight youth reported higher values than OAR youth on Body, $F(1, 442) = 105.1$, $P < .001$; Sport, $F(1, 441) = 39.7$, $P < .001$; Strong, $F(1, 42) = 12.4$, $P = .001$; and Cond, $F(1,441) = 55.8$; $P < .001$, with large effect sizes for many of the variables. The largest differences between NW and OAR youth were for Body; the effect size was Cohen's $d = 1.26$ for boys and $d = .95$ for girls. The differences between NW and OAR youth were also greater for boys in Sport ($d = .89$ vs. $d = .45$). Weight category differences were similar for both genders for Strong ($d = .68$–$.70$), and girls showed larger difference than boys for Cond ($d = .72$ vs. $d = .60$).

Boys reported higher values of PSW than girls, $F(1, 440) = 21.9$, $P < .001$; but GSE values did not vary by gender, $F(1, 442) = .9$, $P = .35$. Normal weight youth showed significantly higher PSW scores than OAR youth, $F(1, 440) = 84.5$, $p < .001$, with large effect sizes ($d = .74$ [girls]–1.16 [boys]). NW youth also reported higher GSE than OAR youth, $F(1, 442) = 19.7$, $P = .001$, but the effect sizes were smaller ($d = .32$ [girls]–.74 [boys]) than those shown for PSW.

Table 3.8 shows comparisons of the perceived importance variables by gender and body composition status. There was not a significant overall gender difference for BodyPI, SportPI or CondPI, but boys rated StrongPI higher than girls, $F(1, 437) = 18.4$, $P < .001$. Normal weight youth rated BodyPI, $F(1, 439) = 10.3$, $P < .001$; CondPI, $F(1, 438) = 20.2$, $P < .001$; SportPI, $F(1, 436) = 22.3$, $P < .001$; and Strong PI, $F(1, 437) = 9.2$, $P = .003$, higher than OAR youth. The effect sizes for these comparisons were in the small to moderate range ($d = .26$–$.57$). Differences between NW and OAR youth were larger for boys than girls in BodyPI and Sport PI. Differences between NW and OAR youth were similar by gender for StrongPI and CondPI.

Comparisons of PAQ-A by gender and body composition status are shown in Figure 3.2. Analysis of variance showed significant differences in PAQ-A by body composition, but not gender. OAR youth reported lower levels of physical activity than NW youth of both genders, $F(1,465) = 24.65$, $P < .001$.

Discussion

This is the first study to examine differences in physical self-perceptions and the factor structure of the CY-PSPP by body composition status. The traditionally reported chi-square differences (between the observed data and the data implied by the specified model) were significant, meaning the model did not fit, but this statistic is sensitive to sample size, thus evaluating other fit indices is recommended (Marsh, Balla, & McDonald, 1988). Using other fit indices, however, the CY-PSPP measurement model showed adequate fit to the data by gender and also by body composition status in girls, further validating its use with a more representative sample of adolescents. The structural model also showed a very similar fit to the data for all groups when using the CFI, but the SRMR was larger (although still showing adequate fit) for the NW and OAR girls' subsamples.

Although the structural model used in this study (replicating earlier work by Welk & Eklund) works well for examining the hierarchical nature of the relationship between the latent variables of self-esteem, physical self-worth, and perceptions of body attractiveness, sport competence, strength adequacy, and condition adequacy, it does not explain the relationship of the CY-PSPP with physical activity. Furthermore, since global self-esteem is affected by other areas in life such as academics, art, and social roles, if physical activity is not valued by an individual the impact of this variable in self-esteem may be reduced. It is well established that people are likely to value areas where they can succeed and place less importance on other areas.

From an examination of GSE across groups, there was evidence of "discounting" (Harter, 1990) the importance of the subdomains of body attractiveness, conditioning, strength, and sport competence by OAR youth (i.e., correlations between GSE and the CY-PSPP subscales were lower in OAR youth). The "discounting" of the importance of the subdomains was further evidenced by the lower perceived importance of the study variables. Discounting the importance of those factors may have played a role in preserving the GSE of OAR youth.

The current sample had a slightly lower percentage of girls and boys in the overweight and at risk for overweight category than the national average (30%) and the state average of 28% (YRBS). The fact that the national and state averages are based on self-reported height and weight raises the possibility that this sample had comparatively lower prevalence overweight and at risk for overweight in comparison. The lower prevalence of overweight may be due to the high socioeconomic status (SES) of the school (i.e., only 7% of the students are eligible for free and reduced lunch) or due to a possible selection bias with fewer overweight youth volunteering to participate in the study. While a selection bias could be problematic there was still a sufficiently large sample of overweight youth to evaluate the structural characteristics of the model in both groups.

Consistent with other studies, girls reported lower mean physical activity than boys, and younger girls and boys reported greater physical activity than older girls and boys (CDC, 2004b; Prochaska, Sallis, Slymen, & McKenzie, 2003). Girls reported lower values than boys in the CY-PSPP subdomains of Body, Strong, Cond, and Sport, relicatingto previous results

(Fox & Corbin, 1989; Welk & Eklund, 2005). Thus, the gender patterns observed in this study are consistent with past research. This may be because girls place greater emphasis on physical attributes and body attractiveness than boys.

Direct comparisons between normal and overweight youth provide new information about the possible impact of body fat on youth physical self-perceptions. As expected, NW youth reported higher scores on the CY-PSPP subdomain scales of Body, Sport, Strong, and Cond than OAR youth. Although OAR girls reported the lowest levels of physical self-perceptions of the three subgroups tested, OAR boys also had lower perceptions of physical self-worth than NW boys. The difference in physical self-perceptions by body composition status was larger in boys than in girls.

Physical Self-Worth has been consistently associated with Body (Eklund et al., 1997; Welk et al., 1995; Welk & Eklund, 2005; Whitehead, 1995), but in this study the correlations were much stronger. A Swedish study examining physical self-perceptions found Cond was most highly correlated with physical self-esteem for boys, whereas body attractiveness was most highly correlated for girls (Raustorp, Mattsson, Svensson, & Ståhle, 2006). The youth participating in that study were younger (ages 7–14), which may have played a role in the differences in results. The higher correlation shown in this study may be partially explained by the higher value of BodyPI in comparison to CondPI, SportPI, and StrongPI. If physical self-worth is low, increased importance of body attractiveness may actually impede physical activity rather than facilitate it. Zabinski, Saelens, Stein, Hayden-Wade, and Wilfley (2003) found that overweight youth, particularly girls, indicated body consciousness and concern about others seeing their bodies while being active as the most common type of barrier to physical activity. Conversely, overweight adolescent girls with better physical self-perception were more likely to be physically active (Neumark-Sztainer, Story, Hannan, Tharp, & Rex, 2003).

Although there was evidence of “discounting” the importance of the subdomains of body attractiveness, conditioning, strength, and sport competence on global self-esteem by OAR youth, this did not translate into buffering the perception of low physical self-worth. The perceived importance of Body, Cond, Strong, and Sport by individuals may influence the effect of those variables on GSE. Additional work is clearly needed to better understand the factors that may influence discounting and the factors that influence the formation of self-perceptions in youth.

In conclusion, this study systematically extends the validity of the CY-PSPP to an older and more representative sample of adolescents than previously tested. Determining that the CY-PSPP works similarly for both overweight and normal weight youth is important considering the progressive increases in the prevalence of overweight and obesity in this country. This study provides evidence as to the validity and utility of the CY-PSPP scale to inform future intervention research, particularly for overweight adolescent youth. The results clearly indicate the potential vulnerability of overweight adolescent girls to perceptions of lower physical self-worth and lower GSE. The use of body composition status to compare groups revealed that overweight adolescent boys may be more vulnerable to negative physical self-perceptions than previously noted. A limitation of the present study was the inadequate sample size of OAR boys to fully analyze the factor structure for this group. Further study of the CY-PSPP with OAR boys (again, using body composition rather than BMI for weight classification) is indicated. Future studies examining the reliability and validity of CY-PSPP may elucidate the factor structure with greater clarity using a structural model that includes physical activity.

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Table 3.1

CY-PSPP Subscale Inter-correlations[a] by Gender[b]

	Body	Sport	Strong	Condition	PSW	GSE
			Boys (n = 165)			
Body	***.90***	.72	.62	.70	.98	.70
Sport	.62	***.85***	.69	.85	.77	.43
Strong	.54	.58	***.93***	.68	.80	.39
Condition	.62	.72	.56	***.88***	.74	.40
PSW	.86	.65	.65	.69	***.89***	.77
GSE	.56	.41	.33	.37	.61	***.80***
			Girls (n = 285)			
Body	***.93***	.51	.51	.56	.95	.73
Sport	.49	***.88***	.80	.76	.71	.55
Strong	.44	.71	***.91***	.71	.63	.46
Condition	.51	.71	.64	***.92***	.70	.58
PSW	.85	.66	.57	.66	***.92***	.82
GSE	.62	.52	.41	.58	.72	***.86***

[a]All correlations were significant at $p < .01$. [b]Manifest variable correlations are below the diagonal; latent variable correlations are above the diagonal; Chronbach's coefficient alpha listed for each subscale in bold italics along the diagonal.

Table 3.2

CY-PSPP Subscale Inter-correlations[a] for Boys by Body Composition Status[b]

	Body	Sport	Strong	Condition	PSW	GSE
			NW = 108			
Body	***.84***					
Sport	.54	***.85***				
Strong	.65	.55	***.93***			
Condition	.56	.65	.60	***.87***		
PSW	.81	.56	.71	.64	***.85***	
GSE	.52	.41	.39	.34	.57	***.80***
			OAR = 59			
Body	***.87***					
Sport	.55	***.82***				
Strong	.29 NS	.60	***.91***			
Condition	.48	.79	.35	***.82***		
PSW	.78	.62	.48	.51	***.86***	
GSE	.49	.25 NS	.03 NS	.18 NS	.60	***.82***

[a]All correlations were significant at $p < .001$, unless specified as non-significant (NS). Due to inadequate sample size, latent variable correlations were not calculated for the subsamples of NW boys and OAR boys. [b]Chronbach's coefficient alpha listed in bold italics along the diagonal for each subscale.

Table 3.3

CY-PSPP Subscale Inter-correlations[a] for Girls by Body Composition Status[b]

	Body	Sport	Strong	Condition	PSW	GSE
			NW = 153			
Body	***.92***					
Sport	.44	***.87***				
Strong	.41	.73	***.92***			
Condition	.42	.75	.67	***.91***		
PSW	.85	.64	.57	.63	***.90***	
GSE	.65	.49	.43	.58	.72	***.86***
			OAR = 132			
Body	***.90***					
Sport	.46	***.87***				
Strong	.45	.67	***.90***			
Condition	.47	.64	.59	***.91***		
PSW	.81	.64	.57	.62	***.91***	
GSE	.60	.52	.35	.56	.72	***.85***

[a]All correlations were significant at $p < .001$. [b]Chronbach's coefficient alpha listed in italics along the diagonal for each subscale.

Table 3.4

Results of Confirmatory Analyses of Six Factor Structure of CY-PSPP Plus SE Scale

	Sample Size	ML[a]	*df*[b]	*p*	SRMR[c]	CFI[e]
Measurement model						
Total	433	1649.63	579	0.0	.04	.98
Boys	156	1115.19	579	0.0	.04	.97
Girls	275	1363.40	579	0.0	.04	.98
NW Girls	146	1111.85	579	0.0	.06	.97
OAR Girls	129	1108.81	579	0.0	.08	.96
Structural model						
Total	433	1918.41	589	0.0	.06	.98
Boys	156	1238.15	589	0.0	.06	.96
Girls	275	1573.38	589	0.0	.07	.97
NW Girls	146	1266.43	589	0.0	.08	.96
OAR Girls	129	1238.78	589	0.0	.07	.95

[a]ML: Maximum Likelihood statistic. [b]*df*: Degrees of freedom. [c]SRMR: Standardized Root mean squared residual. [e]CFI: Comparative Fit Index

Table 3.5

BMI, Body Fat% PAQ-A, GSE, and PSW Means (and Standard Deviations) by Age and Gender

	Age							
	15		16		17		18	
	Girls (n = 74)	Boys (n = 38)	Girls (n = 144)	Boys (n = 89)	Girls (n = 57)	Boys (n = 38)	Girls (n = 40)	Boys (n = 38)
BMI[a]	22.6 (3.8)	22.9 (4.1)	22.8 (3.8)	23.8 (5.0)	23.1 (3.8)	23.1 (4.0)	22.6 (3.0)	24.3 + (4.0)
Body Fat %[b]	24.3 (5.6)	18 (8.7)	24.3 (5.2)	18.5 (7.1)	25.4 (5.4)	15.2 (5.5)	23.9 (5.4)	15.2 (8.0)
PAQ-A[c]	2.7 (.74)	2.9 (.78)	2.7 (.68)	2.9 (.78)	2.4 (.74)	2.5 (.79)	2.3 (.78)	2.8 (.73)
GSE	3.1 (.67)	3.3 (.57)	3.2 (.58)	3.2 (.59)	3.2 (.51)	3.2 (.51)	3.1 (.52)	3.4 (.50)
PSW[d]	2.7 (.78)	3.1 (.67)	2.7 (.61)	2.9 (.72)	2.8 (.58)	3.1 (.51)	2.6 (.52)	3.3 (.57)

[a]Body mass index (kg·m^2) calculated from measured height and weight. [b]Body fat percentage.
[c]PAQ-A: 1 = no physical activity, 5 = high amount of physical activity. [d]Physical self-worth.

Table 3.6

Bivariate Pearson Product-Moment Correlations[a] of Percent body fat, Physical Activity (PAQ-A), and CY-PSPP Subscales, Physical Self-Worth (PSW), and Global Self-Esteem of Boys and Girls

	BMI percentile	Body Fat %	PAQ-A	Body	Sport	Strong	Cond	PSW
			Boys (n = 165)					
Body Fat %	.57							
PAQ-A	.20	-.21						
Body	-.14 NS	-.58	.41					
Sport	.10 NS	-.37	.56	.62				
Strong	.39	-.12 NS	.47	.52	.59			
Cond	.09 NS	-.44	.54	.62	.73	.55		
PSW	.02 NS	-.52	.49	.86	.66	.64	.68	
GSE	-.05 NS	-.29	.23	.56	.41	.30	.36	.61
			Girls (n = 284)					
Body Fat %	.77							
PAQ-A	.02 NS	-.18						
Body	-.46	-.49	.26					
Sport	.04 NS	-.26	.47	.47				
Strong	.05 NS	-.16	.41	.43	.71			
Cond	-.19	-.38	.49	.50	.72	.64		
PSW	-.36	-.46	.39	.86	.66	.57	.66	
GSE	-.15	-.23	.36	.62	.52	.38	.57	.72

[a] All correlations were significant at $p < .001$, unless identified as NS (non-significant)

Table 3.7

Children and Youth Physical Self Perception Profile Subscale (PSW, Body, Sport, Strong, Cond) Means (and Standard Deviations) by Body Composition Status and Gender

	Overall NW (n = 268) OAR (n = 178)	Boys NW (n =110) OAR (n = 53)	Girls NW (n = 151) OAR (n = 130)	Gender Comparison ES[a]
Body				
NW	2.9 (.70)	3.2 (.56)	2.8 (.76)	.61
OAR	2.2 (.72)	2.3 (.69)	2.2 (.67)	NS
Group comparison	.99	1.26	.95	
Sport				
NW	3.0 (.70)	3.2 (.65)	2.8 (.70)	.59
OAR	2.5 (.68)	2.6 (.59)	2.5 (.71)	NS
Group comparison	.72	.89	.45	
Strong				
NW	2.8 (.74)	3.0 (.70)	2.6 (.71)	.56
OAR	2.5 (.68)	2.7 (.72)	2.4 (.64)	.45
Group comparison	.72	.70	.68	
Cond				
NW	3.1 (.68)	3.3 (.58)	3.0 (.72)	.45
OAR	2.6 (.69)	2.8 (.64)	2.5 (.71)	.44
Group comparison	.68	.60	.72	
PSW				
NW	3.0 (.65)	3.3 (.56)	2.9 (.66)	.65
OAR	2.5 (.67)	2.6 (.60)	2.4 (.68)	.31
Group comparison	.74	1.16	.74	
GSE				
NW	3.3 (.59)	3.4 (.51)	3.2 (.63)	.35
OAR	3.0 (.62)	3.0 (.59)	3.0 (.64)	NS
Group comparison	.48	.74	.32	

[a]Effect size (ES) based on Cohen's d.

Table 3.8

Importance of Body Attractiveness, Physical Condition Adequacy, Strength Competence, and Sport-Athletic Competence Means (and Standard Deviations) by Gender and Body Composition Status[a]

	Overall NW (n = 254) OAR (n = 183)	Boys NW (n =103) OAR (n = 53)	Girls NW (n = 151) OAR (n = 130)	Gender Comparison ES[a]
Importance of Body				
NW	3.0 (.71)	3.0 (.73)	3.1 (.68)	NS
OAR	2.8 (.72)	2.7 (.78)	2.9 (.69)	-.28
Group Comparison	.28	.40	.28	
Importance of Sport				
NW	2.9 (.85)	3.0 (.87)	2.8 (.84)	.23
OAR	2.4 (.84)	2.5 (.92)	2.4 (.81)	NS
Group Comparison	.59	.57	.48	
Importance of Strong				
NW	2.8 (.77)	3.0 (.73)	2.7 (.77)	.40
OAR	2.6 (.77)	2.8 (.80)	2.5 (.69)	.40
Group Comparison	.26	.27	.26	
Importance of Conditioning				
NW	3.0 (.74)	3.1 (.73)	2.9 (.75)	.26
OAR	2.7 (.75)	2.7 (.79)	2.7 (.74)	NS
Group Comparison	.45	.27	.26	

[a]There were no significant differences in the means between genders. NW youth had higher perceived importance ratings than OAR youth on all subscales $F(1, 438) = 16.1$, $p < .001$.

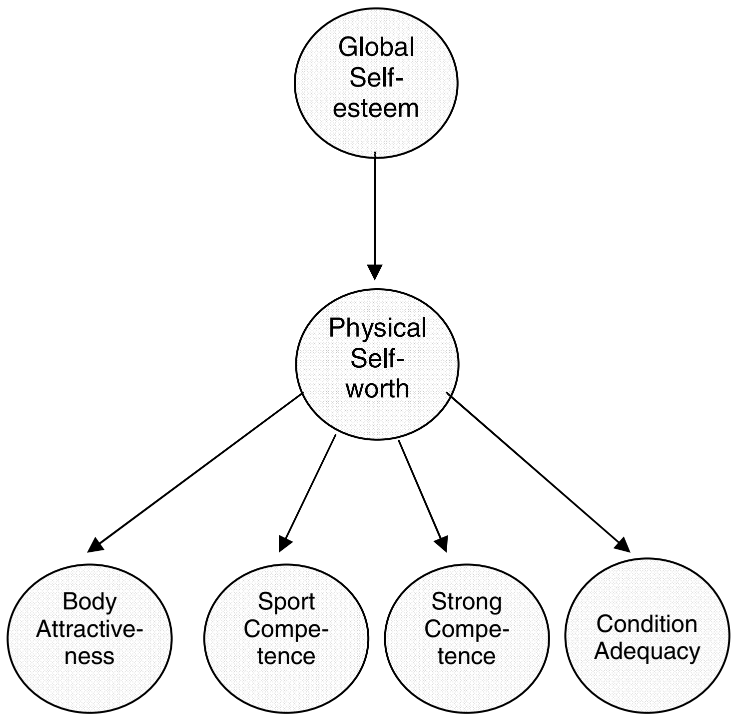
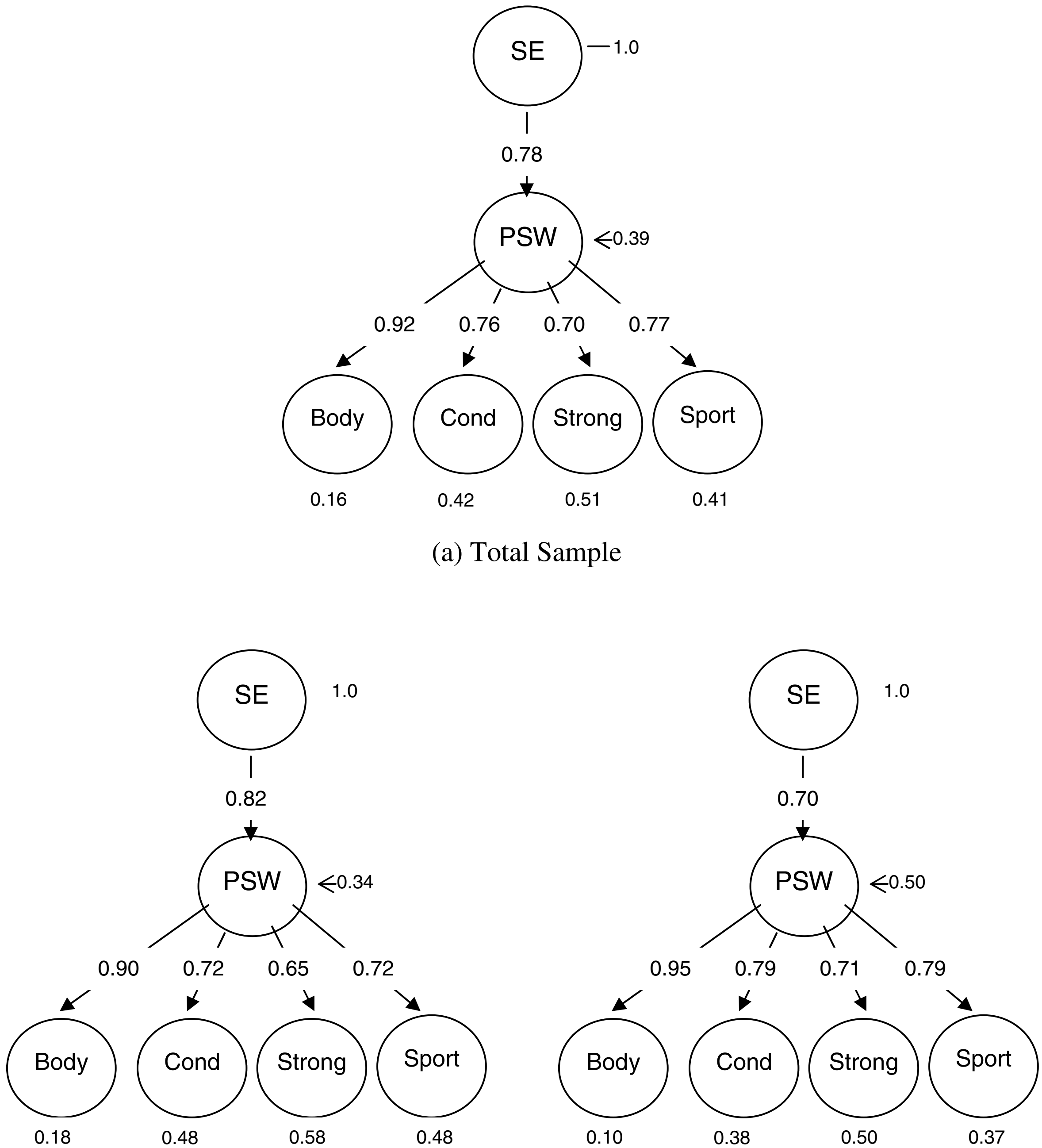


Figure 3.1. Conceptual model of hierarchical relationship of Global Self-esteem and the latent variables represented by the subscales of the CY-PSPP.

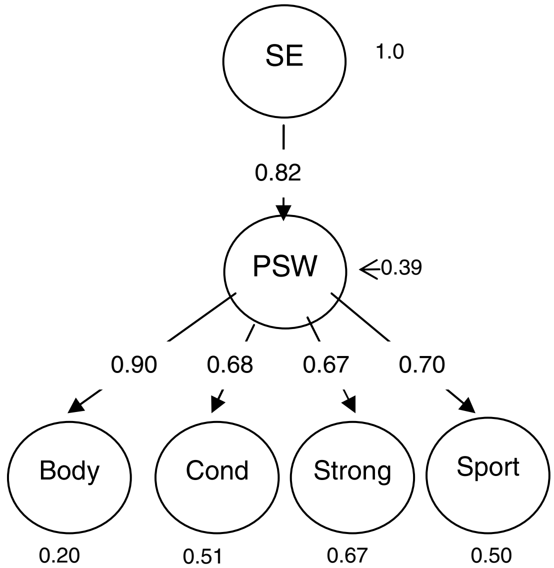


(a) Total Sample

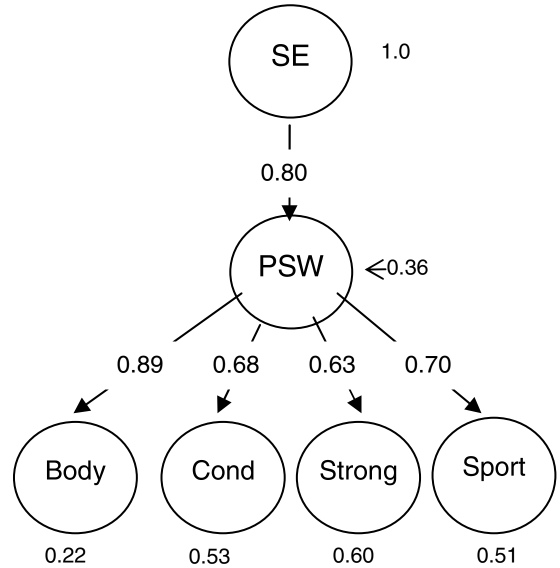
(b) All Girls

(c) All Boys

Figure 3.2. Structural Models of the influence of Global Self-Esteem on Physical Self-Perception.



(d) NW Girls



(e) OAR Girls

Figure 3.2. (continued)

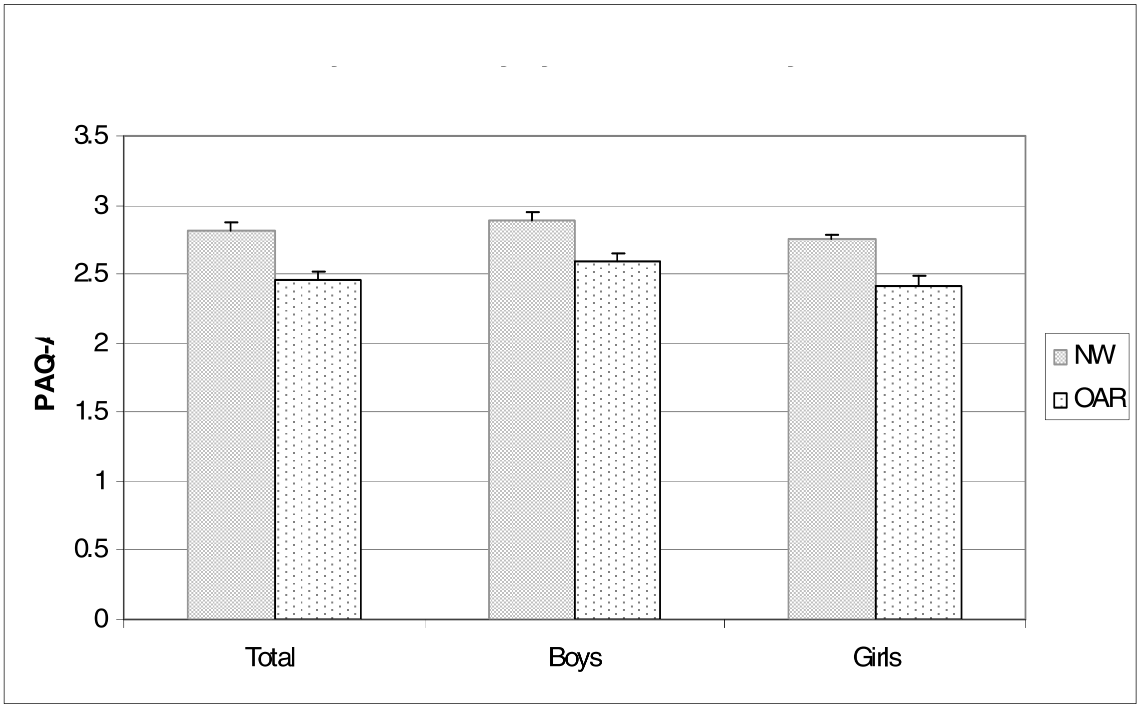


Figure 3.3. Physical Activity by Gender and Body Fat. Physical Activity (PAQ-A) was higher in NW youth than OAR youth, with moderate effect sizes (d = .38-.48). OAR boys were more active than OAR girls (d = .26). The difference between NW boys and girls was non-significant. Bars represent standard errors.

CHAPTER 4
YOUTH PHYSICAL ACTIVITY PROMOTION: DOES BEING OVERWEIGHT MAKE A DIFFERENCE?

A manuscript, of which Study 2 will be submitted to the
American Journal of Preventive Medicine

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Abstract

Introduction: With the increased prevalence of youth obesity, questions about whether *overweight* youth should receive targeted interventions to increase physical activity have received scrutiny. The purpose of the two studies included in this chapter was to 1) examine the influence of being overweight by age and gender on psychosocial correlates of physical activity and 2) extend preliminary development of the Youth Physical Activity Promotion Model, including examination of the effects of body mass index. **Methods:** A large cohort of Iowa youth involved in the Physical Activity and Nutrition Among Rural Youth project were included in the present study (N = 2,341). Data selected for examination in Study 1 were from youth ages of 9–11 years and 14–18 years, to minimize the confounding effects of maturity. Subgroups were determined by body mass index (BMI) percentile cut points identified by the CDC as "at risk for overweight/overweight" and "normal weight." Based on those categories, differences in psychosocial correlates of physical activity by weight status, gender, and age were examined. Study 2 included only data from 9–11 age group. Structural equation modeling was used to examine the utility of the Youth Physical Activity Promotion Model (YPAP) with BMI included in the model. **Results:** The results of Study 1 showed that being overweight is associated with reduced global self-esteem, perceived competence, attraction to physical activity and parental influence for adolescent girls (Cohens' d = .41 -

.57) and elementary-aged girls d = .23 - .42). Overweight status was associated with lower levels of the psychosocial correlates for boys, but the differences were small or non-significant. The results of Study 2 indicated the YPAP model showed good fit to the data and provided parsimony in the evaluation of physical activity while still accounting for a significant amount of variance in physical activity (R^2 = .33). BMI showed a very small direct effect on physical activity, but not show direct or indirect effects on perceived competence, self-esteem, attraction to physical activity or perceived parental influence. **Conclusions:** The results suggest being overweight is associated with lower perceptions of global self-esteem, competence, attraction to physical activity, and parental influence. However, there is no evidence that being overweight has an impact on a model of youth physical activity promotion.

Introduction

The increased prevalence of youth obesity has become an urgent focus of public health. The Centers for Disease Control and Prevention (CDC), the Institute of Medicine, the Robert Wood Johnson Foundation, and other major health-related entities recommend the solution lies at all levels of the social ecological model rather than individual behavior. Implicit in this recommendation is the basic tenet that obesity is a normal response to an abnormal environment (Egger & Swinburn, 1997).

With the increased prevalence of youth obesity, questions about whether overweight youth should receive targeted interventions to increase physical activity have received scrutiny. Although gender and age differences in psychosocial correlates of physical activity have been well studied, the influence of weight status on those correlates remains equivocal as some studies have shown differences (De Bourdeaudhuij et al., 2005; Ward et al., 2006), yet other studies have shown differences (Ball, Marshall & McCargar, 2005; Faith et al., 2002; Fulkerson, et al., 2004; Gordon-Larsen, 2001; Zabinski et al., 2003), while others have not (De Bourdeaudhuij et al., 2005; Ward et al., 2006). Adolescent girls (Erickson, Robinson, Haydel, & Killen, 2000; Faulkner, Neumark-Sztainer, Story, Jeffery, Beuhring et al., 2001; Strauss, 2000) have been shown to have lower levels of the psychosocial correlates of physical activity, but examination of these variables by age group, gender, and weight group are not well established. The developmental stages of childhood further obscure the unique influence weight status may have on those psychosocial correlates. The reciprocal relationship also needs consideration: Does the condition of being overweight affect the child's psychosocial environment?

In response to this problem, a key recommendation by the American Academy of Pediatrics (2003) is to assess social and environmental factors that facilitate or impede physical activity in overweight youth. In addition, a growing consensus among researchers is that identification of psychosocial mediators of physical activity-promoting behaviors will help determine the most promising strategies for targeted interventions (Baranowski, Anderson, & Carmack, 1998; Bauman et al., 2002; King, Stokols, Talen, Brassington, & Killingsworth, 2002). With limited public health dollars, evidence-based solutions to promote physical activity for youth are essential.

Social ecological influences and the mediating variable framework by which they influence physical activity behavior may be best conceptualized through models. Conceptual models of the complex factors that interact and influence youth physical activity are still being developed and refined. One of the limitations of social ecological models has been the absence of the mediating variables (e.g., motivating variables) that may explain behavior change (Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2003). One model that encompasses both behavior change theory *and* the social ecological environment into a unified framework is the Youth Physical Activity Promotion (YPAP) Model (Welk, 1999).

The YPAP model includes cognitive and motivational variables and incorporates several behaviorally based theories including social-cognitive theory (Bandura, 1986) and expectancy-value theories (Ajzen, 1985; Eccles-Parson, Adler, & Kaczala, 1982). The PRECEDE-PROCEED model of health behavior change is also encompassed within the model (Green & Kreuter, 1991). The essence of the PRECEDE-PROCEED model is that psychosocial correlates of behavior change are categorized as "predisposing" (knowledge, attitudes, beliefs), "reinforcing" (support or non-support of family, teachers, and friends), or "enabling" (skill, opportunity, and access) factors depending on their hypothesized influence on the health behavior.

Figure 4.1 presents a conceptual diagram of the YPAP Model. The social cognitive theory (SCT) constructs of outcome expectations and efficacy expectations are categorized as predisposing factors and operationalized in the YPAP model as "Am I able?" and "Is it worth it?" The model illustrates the association and direction of reinforcing, enabling, and predisposing factors on physical activity.

The model is youth-specific, as evidenced by the inclusion of a parental influence construct as a "reinforcing" factor in this model. Theoretically, predisposing factors are the primary influence on physical activity; however, parental influence (a reinforcing factor) may influence activity both directly and indirectly (Welk et al., 2003). The mechanism of parental influence may be partially explained by an expectancy-value framework initially proposed by Eccles-Parson et al. (1982). In this framework, parents' expectations for their child's success and the value parents place on a particular behavior will influence the child's behavior. There is consistent evidence that parental expectations and values are important predictors of their children's physical activity (Kimiecik & Horn, 1998).

Elements of the model and associated measures have been tested in studies of youth physical activity behavior with significant effects shown on physical activity (Welk et al., 2003), but the overall fit of the model has not been extensively evaluated. Preliminary research with data from a sample of primarily white, middle class children ages 8–12 supported the structural links proposed in the model (Welk, Babke, & Brustad, 1998). The YPAP model in that research showed an adequate fit to the data (χ^2 = 402.79, *df*: 181) based on the results of the Comparative Fit Index (CFI = .93) and Non-Normed Fit Index (NNFI = .92).

The potential utility of this model for the public health crisis of youth obesity lies within the information it may provide about future physical activity interventions targeted to youth. If the model explains an adequate portion of the variance in youth physical activity, it can also be used as part of an evaluation framework in which to examine the causal pathways within a multi-faceted social ecological intervention.

The purpose of this study was to examine the influence of being overweight on youth physical activity promotion with a large cohort of Iowa youth. Two separate studies were conducted to accomplish this goal. The first study included data from elementary and high school youth and the second study included data from elementary youth only. The two studies tested the following hypotheses, respectively:

H_1: Based on the extant literature in this area, it is hypothesized that **overweight or at risk for overweight adolescent girls will have the lowest perceptions of global**

self-esteem, perceived sport/athletic competence, and attraction to physical activity of the comparison groups.

It is also anticipated that (a) elementary school-aged children who are overweight or at risk for overweight will show less negative psychosocial and physical activity associations with the condition of being overweight than adolescent youth who are overweight/at risk for overweight, and (b) the differences due to weight category for elementary school-aged youth will be smaller than those shown for adolescent youth. This study will also evaluate the predictive utility of the measures included in the YPAP (as applied to an overweight sample).

The second study includes data from elementary school youth to test and further refine the YPAP Model. The inclusion of body mass index (BMI) as an enabling factor will allow examination of possible moderating effects of being overweight on the psychosocial mediators (including parental influence) of physical activity. This study does not aim to accept or reject the YPAP model; rather, it is an extension of the preliminary development of the model.

Methods

Design

Data from 9 high schools collected in the 2002–2003 Physical Activity and Nutrition Among Rural Youth (PANARY) project and from 17 elementary schools collected in the 2003–2004 PANARY project were analyzed. Details of the scope and purpose of the PANARY project are listed in the Appendix. Data selected for examination in the study were from youth ages of 9–11 years and 14–18 years, to minimize the confounding effect of maturity on the results. Schools that participated in the PANARY project but did not have their students complete all measures and surveys used for this study were not included.

The teachers from the PANARY schools participated in workshops to learn the *FITNESSGRAM* assessment techniques prior to testing. The initial workshop was followed by individual training and technical support from an exercise science graduate assistant assigned to the project. Participants in the study had height, weight, and various fitness parameters assessed during their normal physical education class period. Participants also completed two surveys during physical education class.

Measures

Measures and surveys were identical for the studies with the exception of Aerobic Capacity and the School Survey. Those items were used only in Study 2 and are denoted with an asterisk.

Body Mass Index. Stature was measured using a wall stadiometer. Body mass was measured on a balance beam scale with the participant attired in gym shorts and T-shirt without shoes**.** BMI was calculated from stature and body mass ($kg \cdot m^2$). *BMI-for-age* percentiles were calculated on the basis of the 2000 Centers for Disease Control and Prevention charts (CDC; Ogden, et al., 2002)..

*Aerobic Capacity**. Estimates of maximal aerobic capacity (VO_2 in $ml \cdot kg^{-1} min^{-1}$) were used as an indicator item on the Enabling variable of the YPAP model. Participating schools had the choice of using either the PACER aerobic shuttle run or the Mile Run to collect data on cardio-respiratory fitness on ES youth. Both tests provide reasonable estimates of VO_2 max (Welk, Morrow, & Falls, 2001). Studies have also demonstrated good classification agreement between the PACER and the Mile Run (Mahar et al., 1997).

Surveys

Copies of all surveys and their codebooks are located in the Appendix. The surveys used to evaluate the YPAP model have been validated for a wide age-range and on a diverse population of youth (Schaben et al., 2006; Welk et al., 2003).

Physical Activity Measure. The Physical Activity Questionnaire for Children and Adolescents (PAQ-C; PAQ-A; Crocker et al., 1997; Kowalski, Crocker, & Faulkner, 1997; Kowalski, Crocker, & Kowalski, 1997) is designed to evaluate a child's physical activity levels based on a series of 9 questions that assess activity habits at different times of the day (e.g., PE class, activity at lunch, and activity on the weekend). The Youth version (PAQ-C) has an additional question for activity during recess. Each question is scored on a 1–5 Likert-type scale and the average of the items is used to represent the activity level of the child. As an example, a typical item is, "In the last 7 days, on how many days right after school, did you do sports, dance or play games in which you were very active?" Responses range from 1 (anchored by the phrase "none") to 5 (anchored by "5 times last week"). Although the scale differentiates between more active and less active children, it does not quantify the difference in terms of energy expenditure. The PAQ-C has shown adequate test-retest reliability (range: r = .75–.82) and construct validity (range: r = .45–.53) when compared against other objective measures of physical activity (Crocker et al., 1997; Kowalski, Crocker, & Faulkner, 1997).

School Physical Education Survey.* Teachers involved in the PANARY study completed a School Physical Education Survey based on the CDC's instrument for School Health Program and Policies Study. Two items from the survey, physical education frequency (PEfreq) and physical education time (PEtime), were used as indicator items as part of the Enabling factor in Study 2.

Global Self-esteem scale (GSE; Rosenberg, 1965). Six non-specific items pertaining to self-pride, self-respect, and general competence were used to assess global self-esteem. The Rosenberg self-esteem scale has shown strong validity and reliability (Robins, Hendin, & Trzesniewski, 2001).

Psychosocial correlates. The Children's Physical Activity Correlates (CPAC; Welk, 2000) is a multi-dimensional scale that captures the primary psychosocial correlates of physical activity in the YPAP model. The instrument includes 44 items that assess various psychosocial correlates of physical activity in children. The instrument combines items from a number of other validated scales into one instrument that can be used to evaluate factors related to physical activity in children. The instrument uses a "structured alternative format" to decrease the tendencies for socially acceptable responses. Administrators of the instrument read the questions and ask children to determine which of the two kids described in the question are most like them. Then the administrator asks them to determine if it is "really true" or just "sort of true" for them. The items in the instrument are scored on a four-point scale. The psychometrics of the specific component scales in the CPAC instrument are summarized below:

- *Perceived Competence scale* (PerComp; Harter, 1985). Five items from the Perceived Athletic Competence scale are used to assess efficacy expectations. Past research has shown scale to have acceptable internal consistency ($\alpha = .71$) and good predictive utility of physical activity (Brustad, 1996).

- *Children's Attraction to Physical Activity (CAPA) scale* (Brustad, 1993). The CAPA scale includes 15 items that encompass 5 constructs: (a) Liking of Games (LikeGame), (b) Fun of physical exertion (FunExert), (c) Liking of Exercise (LikeExer), (d) Importance of Exercise (ImpExer), and (e) Peer acceptance (PeerAcc). A summary variable "Attract" computed as the mean of the five component scales is used to reflect overall attraction to physical activity. The primary outcome expectancy for youth is considered to be overall enjoyment of physical activity. The scale has been shown to have acceptable internal consistency (α = .83) and construct validity in predicting physical activity (Welk et al., 2003; Schaben et al., 2006).
- *Parent Socialization Scale* (Welk et al., 2003) includes 18 items that capture three dimensions of parental socialization regarding physical activity. It encompasses the constructs of Perception of Parental Role Modeling (ParRole), Perceptions of Parental Support (ParSup), and Perceptions of Parental Encouragement (ParEnc). A summary variable Parental Influence (ParInf), computed as the mean of the three component scales is used to reflect overall parental influence for physical activity. These items reflect the modeling, social support, and social influence aspects of Social Cognitive Theory. The scale has been previously shown to have acceptable reliability (α = 0.81; Welk, et al., 2003).

Study 1

Analysis

The first part of the study involved an evaluation of the surveys from both normal weight and overweight/at-risk for overweight youth, in addition to the comparative analyses of subsamples. Subgroups were determined by BMI percentile cut points identified by the CDC as "at risk for overweight" and "overweight" (OAR; BMI $\geq 85^{th}$ percentile), and "normal weight" (NW; BMI $<85^{th}$ percentile). Based on those categories, eight total subsamples (age group x gender x weight category) were compared in terms of descriptive, correlational, and inferential analyses. The breakdown of the elementary sample (ES) by weight category reveals a reasonably balanced distribution across the four groups:

- NW ES boys (*n* = 319)
- OAR ES boys (*n* = 186)
- NW ES girls (*n* = 352)
- OAR ES girls (*n* = 184)

The high school (HS) sample included four less balanced groups:

- NW HS boys (*n* = 482)
- OAR boys (*n* = 210)
- NW HS girls (*n* = 531)
- OAR HS girls (*n* = 77)

Descriptive statistics including alpha reliabilities, subscale inter-correlations, means, and standard deviations were calculated by gender, grade level, and weight category of participants. Effect sizes (Cohens' $d = [M_i - M_j]/Sdpooled$) were computed to assess the magnitude of the differences between subgroups. Bivariate Pearson product-moment correlations among the various psychosocial measures and the outcome measure of PAQ were computed.

Because of the nested nature of the data (i.e., individuals within schools), preliminary analyses were conducted to determine the appropriate strategy to examine gender and grade level effects. Intraclass correlation coefficients (ICC) were computed to determine the degree of school-level clustering (Shrout & Fleiss, 1979). School was subsequently entered as a random effect in all univariate analyses.

Model specifications for descriptive statistics:

$$Y_{ijk} = \beta o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_{23} X_{23} + \zeta + \varepsilon_i$$

where Y_i = outcome variable (PAQ-A, GSE, PerComp, CAPA, ParInf), β_o = overall mean, $\beta_1 X_1$ = individual school effects, $\beta_2 X_2$ = age main effects, $\beta_3 X_3$ = weight main effects, $\beta_{23} X_{23}$ = gender x weight interaction, and $\zeta + \varepsilon_i$ are school unit and individual level error terms (which are assumed to be normally distributed with zero means) with Y as the observation on the i gender at the j weight category.

Results: Evaluation of YPAP Measurement Utility

Bivariate Pearson product-moment correlations and alpha reliabilities by age level, gender, and weight status are presented in Tables 4.1–4.4. Alpha reliabilities of the survey scales were in the acceptable range for ES boys (α = .66–.81), ES girls (α = .69–.81), HS boys (α = .72–.84), and HS girls (α = .69–.91). Attraction showed the highest correlations with the other variables for all groups, with the highest correlations between Attract and PerComp (r = .63–.73, $P < .001$). Global Self-esteem showed the lowest correlations with the other variables in the NW HS girls sample (r = .19–.34, $P < .001$); for the OAR HS girls sample, GSE was not significantly correlated with the other variables except ParInf (r = .33, $P < .001$). ParInf was moderately correlated with Attract and PerComp for the other groups (r = .41–.50, $P < .001$).

Correlations of the psychosocial variables with physical activity were small to moderate (r = .19–.56, P < .001) for ES and HS youth, except for the non-significant correlation between GSE and physical activity for ES OAR girls (r = .07) and HS OAR girls (r = .04). Attract showed the highest correlation with physical activity for all subgroups (r = .29–.56, P < .001), and was stronger for older youth. Global Self-esteem showed the lowest correlation with physical activity for all groups (r = .19–.26), and the correlation was non-significant for ES OAR girls. Parental influence was more highly correlated with physical activity in HS (r = .35–.48; P < .001) than ES youth (r = .21–.38; P < .001); ParInf showed the lowest correlation with physical activity in the ES OAR girls sample.

Descriptive statistics and effect sizes are listed in Table 4.5. Mean physical activity and the psychosocial scales of Attract, PerComp, ParInf, and GSE were higher in the ES sample than in the HS sample. Overweight HS girls reported the lowest values of physical activity, Attract, PerComp, ParInf, and GSE. Subgroup analyses for the individual dimensions of the model are described below.

Physical Activity. Adjusting for age and school effects, boys reported higher levels of PAQ than girls in both age groups [ES: $F(1, 1029) = 6.15$; P = .013, and HS: $F(1, 1264)$ = 16.7; P < .001]. Physical activity did not vary by weight status among ES youth, but HS OAR youth reported lower levels than HS NW youth, $F(1, 1264) = 6.316$; P = .012.

Attract. No differences were noted for gender in ES, but HS girls reported lower Attract scores than HS boys, $F(1, 1264) = 7.1$, P = .008. Differences in attraction to physical activity by weight status were small for all groups except adolescent OAR girls (d = -.51). Overweight youth reported lower Attract scores than NW youth in the ES sample, $F(1, 1029)$ = 11.57; P <.001, and HS sample, $F(1, 1264) = 26.5$; P < .001. Overweight HS girls reported the lowest scores in Attract and this difference was significant at the 95% CI from NW HS girls (d = .57).

PerComp. Girls reported lower PerComp than boys in ES, $F(1, 1029) = 12.98$; $P <$ .001, and HS, $F(1, 1264) = 35.6$; $P < .001$. Overweight youth reported lower PerComp than NW ES youth, $F(1, 1029) = 7.04$; $P = .008$, and HS youth, $F(1, 1264) = 10.08$; $P = .002$. Differences in perceived competence by weight status were largest for adolescent OAR girls (d = .50).

ParInf. ParInf did not vary by gender or weight status in ES youth. There were no significant overall differences in ParInf by gender among HS youth. Overweight HS youth reported lower ParInf than NW HS youth, F(1, 1264 = 11.15; $P < .001$. For the HS sample, OAR girls reported lower ParInf than NW girls with a moderate effect size (d = .47).

Global Self-esteem. Global Self-esteem did not vary by gender among ES youth, but overall GSE was lower for HS girls than HS boys, $F(1, 1264) = 10.61$; $P < .001$. Overweight youth had lower GSE [ES: $F(1, 1029) = 13.5$; $P < .001$, and HS: $F(1, 1264) = 9.55$; $P =$ .002]. Overweight girls reported lower Self-esteem than NW girls with a small effect size for ES girls (d = .39) and a moderate effect size for HS girls (d = .54).

Study 2

Analysis

The second part of the study used data exclusively from the elementary student sample. The purpose of this study was to further evaluate the YPAP model. BMI was included as part of the enabling construct in the model to further examine the influence of weight status on physical activity promotion.

The fit indices of the YPAP model were analyzed through structural equation modeling (SEM) using LISREL 8.7 (Joreskog & Sorbom, 2005). Cases with missing data were excluded from the analysis (<.01% after data from schools without complete data sets were deleted). Latent variables were modeled by specifying a measurement model and a structural model. The measurement model specified the relationships between the observed indicators and the latent variables and the structural equation model specified the relationships amongst the latent variables.

Measurement model. The measurement model of the YPAP included the PerComp, GSE, CAPA, and the ParInf scales. Fifteen indicator items and 6 latent variables were specified for the measurement model (shown in Figure 4.2). The indicator items included the PAQ items on the criterion latent variable "Physical Activity." PerComp and GSE items loaded on the latent variable "Am I able?" Items from the CAPA scale loaded on the latent variable "Is it worth it?" Items from the ParInf scale loaded on the latent variable "Reinforcing." PEfreq, PEtime, BMI, and VO_2 loaded on "Enabling."

Maximum likelihood estimation procedures were used for calculating item loadings on the specified latent variables. Psychometric properties of the variables were evaluated by examining the internal reliability of the component scales and by subscale inter-correlations. Items were constrained a priori to load on their previously established constructs. Latent variable interfactor correlations, standard errors, *t* values, and squared multiple correlations were also examined.

Structural model. In the structural model, VO_2, BMI, and Reinforcing variables were identified as exogenous variables (ξ) because they are not affected by any other construct in the model. "Am I able?" and "Is it worth it?" were specified as latent, endogenous constructs

(η) because they are affected by other constructs (such as VO_2 and the Reinforcing variable describing parental influence).

Given that the traditional χ^2 test is sensitive to sample size (Anderson & Gerbing, 1984; Marsh, Balla, & McDonald, 1988), results were further evaluated with CFI (Bentler, 1990) and the standardized root mean square residual (SRMR).

Results: Evaluation of the YPAP Model

Measurement model. Psychometric results for the manifest variables were reported in Study 4a. Physical education time and frequency showed factor loadings and error variances outside the recommended range of -1 to +1, and R^2 values were non-significant, so those indicator items of the Enabling variable were deleted. The indicator item of ImpExer showed a very low loading (.33) on "Is it worth it," so that item was also deleted.

Table 4.6 shows the latent variable correlations. All correlations were significant except for the correlation of BMI with Physical Activity and the Reinforcing variable. The latent variables "Am I able?" and "Is it worth it?" were highly correlated (ϕ = .92). Standardized factor loadings (and error terms) on the latent variables are shown in Table 4.7 (BMI and VO_2 loadings were set at 1.0.). Mean indicator item loading was λ = .63 which is less than the desired λ = .70 (Sharma, 1996) primarily due to the low loadings of items of ImpExer (λ = .33) and LikeGame (λ = .56) on the latent variable, "Is it worth it?," and GSE (λ = .58) on the latent variable "Am I able?" PerComp, ParRole, and ParSup had the highest factor loadings on their respective latent variables. Squared multiple correlations were particularly low for indicator item GSE (.34), but the item was retained due to extensive past evidence supporting the link between GSE and physical activity.

The final measurement model showed adequate fit to the data for the latent variables Physical Activity, Am I able?, Is it worth it?, Reinforcing, BMI, and VO_2. Although the χ^2 statistic was significant ($\chi^2 = 341.57$, $P = 0.0$, $df = 67$), the SRMR was .037, and the CFI was 0.97, both indicating adequate fit to the data. The difference between the initial and final model was significant ($\chi^2 = 451.39$, $df = 42$).

Structural model. Fit indices, χ^2, *df*, and SRMR of the measurement model and structural models that were tested are shown in Table 4.8. The initial structural model specifications included 14 items loading on 2 exogenous variables and 3 endogenous adding a new path from BMI to Physical Activity. BMI and VO_2 were separated and identified as distinct exogenous variables rather than the two combined as an Enabling latent variable. The largest modification indices were to categorize "peer acceptance" with Per Comp (χ^2 decrease of 94.1), but based on substantial previous work with these items, the path did not fit with established theory and thus was not inserted.

Figure 4.3 shows the final structural model. The model specifications included 13 items loading on 3 exogenous variables and 3 endogenous variables and showed good fit to the data ($\chi^2 = 165.43$, $df = 59$). Although the χ^2 was significant, the standardized root mean square residual was 0.03, well within the recommended range . The CFI was 0.98, which exceeds the recommended .95 for good fit. The difference between initial and final model was significant ($\chi^2 = 179.69$, $df = 29$).

Thirty three percent of the variance in physical activity was accounted for by the model, which is higher than the recommended minimum of $R^2 = .30$ for models of physical activity (Baranowski, et al., 2003). BMI did not have a statistically significant effect on any of the variables except for a very small loading (.11) on Physical Activity. The exogenous variables VO_2, and Reinforcing (which captured parental influence in this model) accounted for a substantial amount of the variance in the construct "Am I able?" (61%) and "Is it worth it?" (72%). The Reinforcing variable had indirect effects on Physical Activity and "Is it worth it?" and direct effects on "Am I able?"

Discussion

These two studies provided new and important information about the effect of being overweight on the psychosocial correlates of youth physical activity and on the utility of a mediating variable framework (YPAP model) to account for differences in physical activity. The results suggest being overweight is associated with lower perceptions of global self-esteem, competence, attraction to physical activity, and parental influence, particularly for OAR adolescent girls. However, there is *no* evidence that overweight has an impact on a model of youth physical activity promotion. The studies extend previous work on the predictive utility of the CPAC instrument and the YPAP model.

Study 1

The results of Study 1 show that being overweight is associated with reduced global self-esteem, perceived competence, and attraction to physical activity. However, differences by weight status were small to non-significant, except for some moderate differences by weight status for adolescent girls. Past research has shown that adolescent overweight girls are a vulnerable group to negative self-appraisals related to physical activity (Erickson, Robinson, Haydel, Killen, 2000; Faulkner Neumark-Sztainer, Story, Jeffery, & Beuhring, 2001; Haverly & Davison, 2005; Pesa, Syre, & Jones, 2000; Strauss, 2000), but direct comparisons of gender, age, and weight status with a similar cohort have not been investigated. In this study, the lowest scores of global self-esteem, attraction to physical activity, perceived competence, and parental influence were reported by overweight adolescent girls, but overweight adolescent boys and younger overweight youth of both genders showed vulnerability to the negative perceptions as well. The less positive perceptions of self-esteem, perceived competence, and attraction to physical activity associated with being overweight have been better documented for adolescent girls (Erickson et al., 2000; Faulkner et al., 2001; Haverly & Davison, 2005; Pesa et al., 2000; Strauss, 2000), but this study suggests that OAR adolescent boys and younger girls and boys may have lower levels of these variables than previously thought, although the differences were smaller for those groups.

The lower levels of global self-esteem and other psychosocial variables among overweight Iowa youth, although small, is a cause for concern. The weight categories are not well differentiated when the 84th percentile of BMI-for-age is classified as NW and the 85th percentile is classified as OAR. Further separation of groups (i.e., normal weight and overweight, not at risk for overweight) may better clarify the results. Negative self-appraisals may create additional barriers to youth physical activity and reduce motivation to be physically active (Biddle & Wang, 2003). The specificity of these results to Iowa provide an opportunity to inform policy makers of the potential negative psychosocial sequelae associated with the condition of being overweight, and to recommend policies regarding opportunities for physical activity to address the problem.

Study 2

Study 2 extends the preliminary validation work on the YPAP Model (Welk, 1999). Previous research has provided evidence as to the predictive utility of the scales and aspects of the YPAP model but this is the first study to thoroughly investigate model fit. Some modifications to the original model were necessary, but this was somewhat expected since the YPAP model is in the developmental stages. The fit of the model to the data also depends on the type of measures that are used to capture the various constructs. Similar to past work, the ImpExer was not an adequate indicator of the “Is it worth it?” (also operationalized at attraction to physical activity) construct. More surprising was the small effect of global self-esteem on physical activity.

The potential influence of the condition of overweight within the model was examined by including BMI as an exogenous variable. BMI did not appear to affect the mediating variables, but did show a small direct influence on physical activity. A unique finding was that BMI was not correlated with parental influence, yet in comparing reported parental influence of youth by weight status, mean scores were lower for overweight adolescents and overweight ES girls.

Past research has indicated that there may be parental bias towards their overweight children (Krahnstoever-Davison, Francis, & Birch, 2005), but there was no evidence shown in the path coefficients of the YPAP model to suggest bias in this sample. This overall effect certainly does not mean that there are not individual cases of negative parental bias toward youth who are overweight, which may be reflected in the finding of mean score differences in perceived parental influence by weight status. There may have been measurement issues clouding this finding as well. BMI was entered into the model as a linear variable, yet the condition of being overweight may be more accurately represented using the concept of a threshold for negative effects. It is well accepted that “normal weight” varies from person to person, which may confound the identification of that threshold point.

The YPAP model used in this study provided further clarity on the relationships between parental influence, perceived competence (Am I able?), and attraction (Is it worth it?) to physical activity. Previous work showed parental influence (a Reinforcing variable) to be an important factor in youth physical activity (Kimiecik & Horn, 1998; Schaben et al., 2006; Welk et al., 2003), but the use of structural equation modeling allowed a more comprehensive examination of the factors that affect physical activity. The technique also has the advantage of showing more accurate estimates for the relations between latent constructs (such as psychosocial variables) by explicitly modeling the measurement error (Pedhauzer & Schmelkin, 1991). It allows examination of problems similar to the way they occur in a natural setting: simultaneous influences of multiple factors. Since physical activity promotion is multi-faceted, it makes good theoretical sense to evaluate those factors using this technique.

The model also extended previous work showing that perceived competence and attraction to physical activity mediated the effect of parental influence on youth physical activity (Schaben et al., 2006) by modeling the additional pathway showing the effect of perceived competence on physical activity is mediated by attraction. Paxton et al. (2004) has shown a similar mediating effect of attraction (Is it worth it?) in the relationship between perceived competence (Am I able?) and physical activity, but the model did not include the link of parental influence or examine the effect of weight status.

The dilemma in examining physical activity in a psychosocial and social ecological theoretical framework is balancing parsimony with comprehensiveness. Structural equation modeling has been highly recommended for evaluating longitudinal intervention studies as a better way to determine *how* an intervention worked, rather than simply that it did work.

Ward, Dowda, Trost, Felton, Dishman, et al. (2006) have used structural equation modeling to evaluate the effectiveness of a large-scale longitudinal intervention to increase youth physical activity. The model included multiple factors and large degrees of freedom and did not provide a good fit to the data, but was an important step in the direction towards better evaluation of intervention efforts.

The YPAP model showed good fit to the data and provided greater parsimony in the evaluation of physical activity without sacrificing the variance in physical activity explained by the model. However, this does not mean the YPAP model should be used exclusively for the evaluation of youth physical activity behavior; it simply means that further work is needed to capture the factors that influence physical activity and to balance completeness with parsimony. Participant burden and investigator cost of multiple surveys need to be balanced with accurate evaluation of interventions.

Strengths and Limitations

The strengths of this study included the large sample size of Iowa youth, the use of previously validated survey instruments to examine the influence of being overweight on the psychosocial correlates of physical activity, and the use of structural equation modeling to extend previous work testing mediating variables predicting youth physical activity. However, some limitations should be noted. Although the sample of Iowa youth was large, it was not randomly selected. There may have been selection bias as schools and teachers volunteered to be part of the project, which may have reflected greater interest in health and physical activity. Another limitation may be the use of BMI to determine overweight and normal weight status, particularly with boys. While BMI is strongly recommended as a cost-effective screening tool for overweight, the misclassification of overweight based on cut points may obscure the associations of overweight with the psychosocial correlates of physical activity. The strongest and most athletic boys may be misclassified as overweight by the BMI cut points established by the CDC, thus confounding the results. Future studies should use body composition to determine overweight classifications. In addition, the very low prevalence of overweight/at risk for overweight adolescent girls in this study (13%) suggests systematic reporting bias. National and regional data consistently report overweight/at-risk for overweight prevalence of adolescent girls to be closer to 28% (CDC, 2006). As the expense of bio-electrical impedance devices is reduced, body composition testing may be as fast and convenient as measuring height and weight for studying psychosocial correlates of physical activity

Measures used to capture environmental exposure in Study 2 (physical education time and frequency) did not work well, but that may be explained by the outcome measure used for physical activity. The PAQ assesses physical activity with items that reflect different periods of the day and week (i.e., after school, evenings, and weekends), which would not necessarily be affected by physical education duration and frequency. Second, while the PAQ is a good physical activity survey, particularly in a population-based study such as this, actual measurement of physical activity by pedometer or accelerometer may be necessary to further refine the YPAP model.

Conclusions

Psychosocial correlates and mediators of physical activity may present unique barriers for overweight youth. The conclusions of this study are not intended to be generalized towards individual overweight youth. Instead, models such as the PROCEED/PRECEDE and YPAP exist to help explain natural phenomenon and provide a framework in which to examine factors that influence physical activity. Future research with adolescents using the Youth Physical Activity Promotion model may extend the utility of the YPAP as an evaluation framework for intervention studies. Further evaluation of enabling or ecological measures for use in the model may also enhance the overall utility of the YPAP.

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These untoward effects seem to particularly affect white adolescent girls (Erickson, Robinson, Haydel, & Killen, 2000; Faulkner, Neumark-Sztainer, Story, Jeffery, Beuhring et al., 2001) and acculturated adolescent Hispanic girls (Strauss, 2000).

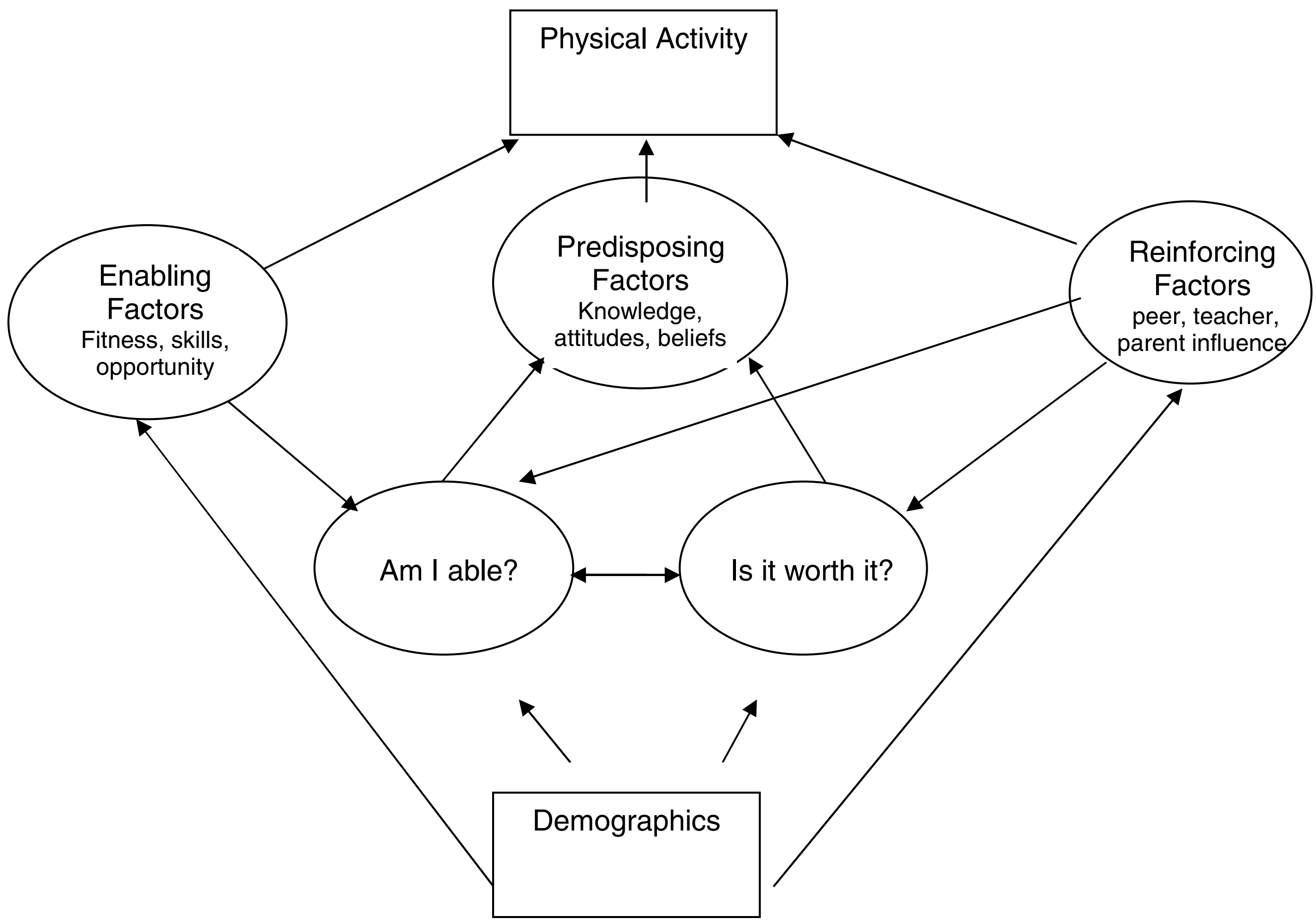

Figure 4.1: Conceptual diagram of the Youth Physical Activity Promotion Model

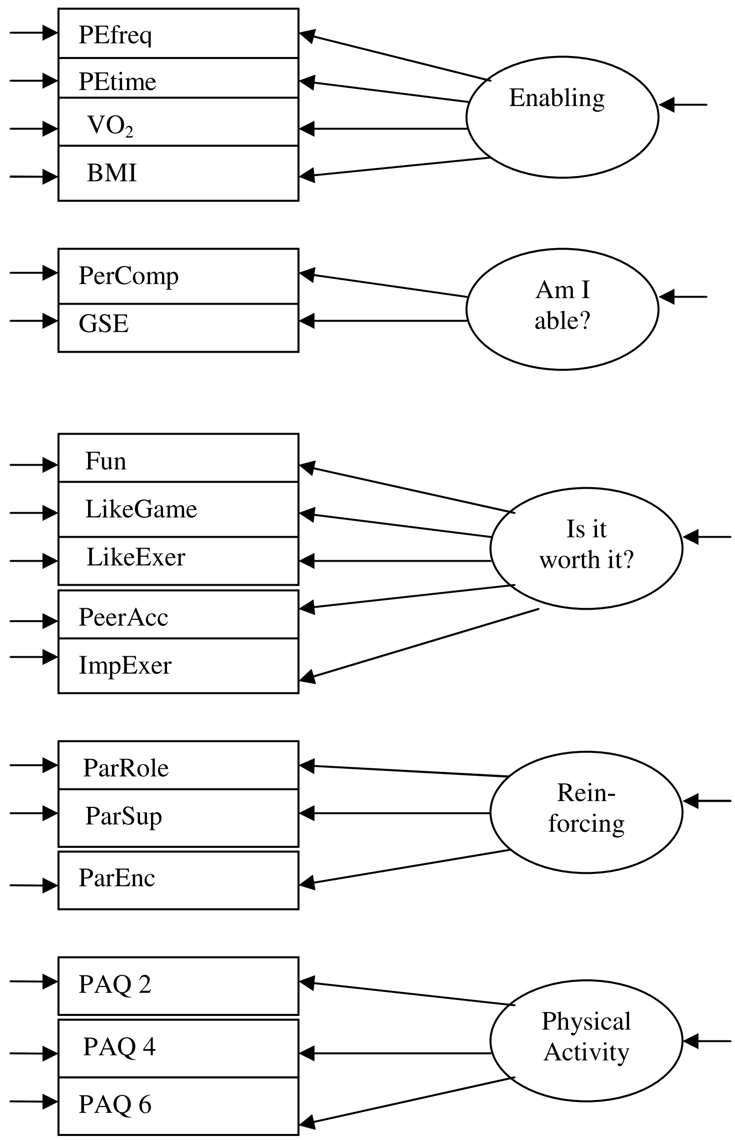

Figure 4.2. Initial Youth Physical Activity Promotion measurement model specifications.

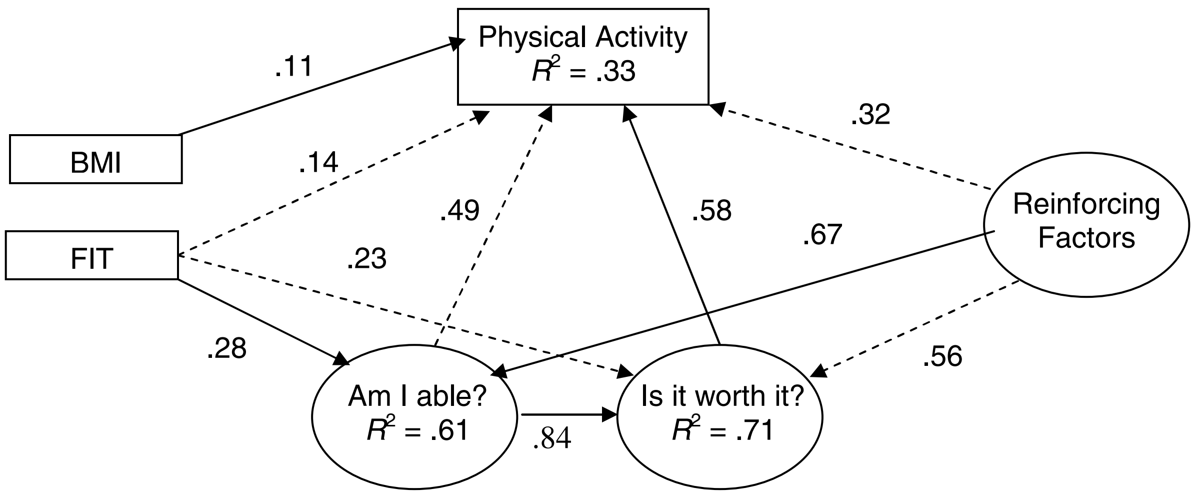

Figure 4.3. Final Structural Youth Physical Activity Promotion Model. Model shows fitness (VO_2) and BMI as separate exogenous variables instead of combined as an enabling factor. Am I able? and Is it worth it? may be categorized as "predisposing" variables, but the two latent variables need to be separated for structural equation modeling. The solid lines indicate direct effects and the dashed lines show indirect effects.

Table 4.1

Bivariate Pearson Product-Moment Correlations[a] (below the diagonal) and Alpha Reliabilities (in italics on the diagonal) of Physical Activity and Psychosocial Correlates of Physical Activity in Normal-Weight and Overweight/At-Risk for Overweight ES Boys

Variables	PAQ-C	Attract	PerComp	ParInf	GSE
NW (n = 345)					
PAQ-C	***.77***				
Attract	.44	***.66***			
Per Comp	.36	.63	***.78***		
Par Infl	.27	.51	.43	***.68***	
GSE	.20	.52	.51	.38	***.87***
OAR (n = 194)					
PAQ-C	***.81***				
Attract	.45	***.77***			
PerComp	.31	.66	***.82***		
ParInf	.35	.48	.45	***.71***	
GSE	.19	.43	.46	.27	***.89***

[a]All correlations were significant at $p < .001$.

Table 4.2

Bivariate Pearson Product-Moment Correlations[a] *(below the diagonal) and Alpha Reliabilities (in italics on the diagonal) of Physical Activity and Psychosocial Correlates of Physical Activity in Normal-Weight and Overweight/At-Risk for Overweight ES Girls*

Variables	PAQ-C	Attract	PerComp	ParInf	GSE
NW (n = 371)					
PAQ-C	***.81***				
Attract	.43	***.71***			
Per Comp	.41	.66	***.79***		
Par Infl	.39	.50	.51	***.73***	
GSE	.25	.47	.46	.41	***.88***
OAR (n = 194)					
PAQ-C	***.73***				
Attract	.29	***.69***			
PerComp	.23	.73	***.80***		
ParInf	.21	.52	.57	***.75***	
GSE	.07[NS]	.42	.44	.31	***.85***

[a]All correlations were significant at $p < .001$, unless identified as NS (non-significant).

Table 4.3

Bivariate Pearson Product-Moment Correlations[a] (below the diagonal) and Alpha Reliabilities (in italics on the diagonal) of Physical Activity and Psychosocial Correlates of Physical Activity in Normal-Weight and Overweight/At-Risk for Overweight HS Boys

Variables	PAQ-A	ATTRACT	PerComp	ParInf	GSE
NW (n = 474)					
PAQ-C	***.81***				
ATTRACT	.50	***.80***			
Per Comp	.42	.68	***.83***		
Par Infl	.35	.50	.46	***.72***	
GSE	.26	.47	.48	.37	***.84***
OAR (n = 196)					
PAQ-C	***.73***				
ATTRACT	.59	***.70***			
PerComp	.52	.64	***.83***		
ParInf	.49	.48	.49	***.84***	
GSE	.24	.44	.47	.23	***.85***

[a]All correlations were significant at $p < .001$.

Table 4.4

Bivariate Pearson Product-Moment Correlations[a] (below the diagonal) and Alpha Reliabilities (in italics on the diagonal) of Physical Activity and Psychosocial Correlates of Physical Activity in Normal-Weight and Overweight/At-Risk for Overweight HS Girls

Variables	PAQ-C	ATTRACT	PerComp	ParInf	GSE
NW (*n* = 525)					
PAQ-C	***.81***				
ATTRACT	.56	***.81***			
Per Comp	.49	.69	***.85***		
Par Infl	.36	.46	.41	***.75***	
GSE	.20	.28	.34	.32	***.91***
OAR = (*n* = 77)					
PAQ-C	***.80***				
ATTRACT	.46	***.69***			
PerComp	.48	.63	***.83***		
ParInf	.41	.50	.33	***.78***	
SE	.04[NS]	.18[NS]	.13[NS]	.31	***.87***

[a]All correlations were significant at $p < .001$, unless specified as non-significant (NS).

Table 4.5

Descriptive Statistics for Physical Activity and Psychosocial Correlates of Physical Activity in ES (n = 1103) and HS Youth (n = 859) with Unadjusted Means (and Standard Deviations)

	Overall		Males		Females	
	ES	HS	ES	HS	ES	HS
	NW: *n* = 715 OAR: *n* = 388	NW: *n* = 1013 OAR: *n* = 287	NW: *n* = 344 OAR: *n* = 194	NW: *n* = 482 OAR: *n* = 210	NW: *n* = 371 OAR: *n* = 194	NW: *n* = 531 OAR: *n* = 77
PAQ						
Normal weight	3.2 (.75)	2.7 (.64)	3.3 (.76)	2.8 (.69)	3.1 (.73)	2.6 (.59)
Overweight	3.2 (.70)	2.6 (.66)	3.2 (.72)	2.7 (.70)	3.1 (.68)	2.4 (.61)
Effect size	NS[a]	.18	NS	NS	NS	.33
Attract						
Normal weight	3.2 (.62)	3.0 (.54)	3.2 (.42)	3.1 (.53)	3.1 (.44)	3.0 (.54)
Overweight	3.0 (.63)	2.9 (.52)	3.0 (.48)	2.9 (.54)	3.0 (.42)	2.7 (.44)
Effect size	.22	.32	.37	.34	.23	.57
PerComp						
Normal weight	3.2 (.62)	2.8 (.65)	3.3 (.60)	3.0 (.65)	3.1 (.63)	2.7 (.63)
Overweight	3.0 (.66)	2.7 (.68)	3.1 (.66)	2.9 (.66)	2.9 (.65)	2.4 (.64)
Effect size	.22	.12	.31	NS	NS	.50
ParInf						
Normal weight	3.1 (.43)	2.9 (.46)	3.1 (.43)	2.9 (.43)	3.2 (.43)	2.9 (.48)
Overweight	3.1 (.46)	2.8 (.49)	3.1 (.45)	2.8 (.47)	3.0 (.47)	2.7 (.53)
Effect size	NS	.24	NS	.22	.45	.41
GSE						
Normal weight	3.4 (.65)	3.1 (.66)	3.5 (.65)	3.2 (.62)	3.4 (.65)	3.0 (.69)
Overweight	3.2 (.74)	3.0 (.70)	3.2 (.74)	3.1 (.67)	3.2 (.74)	2.7 (.70)
Effect size	.34	.19	.43	NS	.29	.42

[a]NS: Non-significant difference at 95% confidence interval (CI).

Table 4.6

Latent Variable Correlations (with variance on the diagonal; N = 1037)

	PAQ-C	Is it worth it?	Am I able?	Reinforcing	VO_2
Is it worth it?	.57				
Am I able?	.42	.92			
Reinforcing	.42	.69	.67		
VO_2	.24	.40	.42	.25	
BMI	.04	-.10	-.15	-.04	-.40

Table 4.7

Standardized Solution for Factor Loading Matrix (Lambda X Measurement Model with error in parentheses)[a]

	Physical Activity	Is it worth it?	Am I able?	Reinforcing
PAQ2	.64 (.58)			
PAQ4	.69 (.52)			
PAQ6	.64 (.60)			
ImpExer		.33 (.90)		
LikeGame		.56 (.69)		
Fun		.67 (.52)		
LikeExer		.65 (.57)		
PeerAcc		.61 (.63)		
PerComp			.81 (.26)	
GSE			.58 (.66)	
ParSup				.69 (.53)
ParMod				.79 (.37)
ParEnc				.59 (.63)

Table 4.8

Youth Physical Activity Promotion Measurement and Structural Models

	Sample Size	ML[a]	df[b]	*p*	SRMR[c]	CFI[d]
Measurement model						
Model 1	1037	792.96	109	0	.08	.92
Model 2	1037	341.57	67	0	.037	.97
Structural model						
Model 1	1037	345.12	70	0	.038	.97
Model 2	1037	165.43	59	0	.029	.98

[a]ML: Maximum Likelihood Statistic. [b]*df*: Degrees of freedom. [c]SRMR: Standardized Root mean squared residual. [d]CFI: Comparative Fit Index.

CONCLUSIONS

The new public health crisis of youth obesity demands our attention. Increased physical activity is broadly recommended, but the condition of being overweight may present additional barriers to being active. Key recommendations to advance the promotion of youth physical activity include (a) assessing social and environmental factors that facilitate or impede physical activity in overweight youth, (b) identifying psychosocial mediators of physical activity-promoting behaviors to determine the most promising strategies for targeted interventions, and (c) using an evaluation framework that includes mediating variables in order to ascertain the most effective components of interventions.

Potential differences in the psychosocial correlates and social ecological variables of physical activity of overweight/at-risk for overweight and normal weight Iowa youth were examined in this study. The results showed that being overweight is associated with lower perceptions of global self-esteem, physical self-worth, body attractiveness, sport/athletic competence, strength adequacy, condition adequacy, attraction to physical activity, and parental influence in relation to physical activity. However, there was no evidence that body mass index has an impact on the factor structure of the Children and Youth Physical Self-Perception Profile or on the Youth Physical Activity Promotion model. This finding provides evidence that being overweight is a moderating variable rather than a mediating variable for youth physical activity promotion. It also provides support for use of the Youth Physical Activity Promotion model as an evaluation tool for physical activity interventions.

The rationale for this research was that by examining unique subpopulations (rural vs. urban; overweight vs. normal overweight) within a psychosocial and social ecological framework, the theoretical basis for designing physical activity interventions for youth in communities and schools across Iowa would be strengthened. A secondary purpose of this research was to ensure the measurement tools used to evaluate the psychosocial and social ecological correlates of physical activity are valid for overweight youth.

This dissertation research provided evidence for the selection of a target population and evaluation framework for a state-wide physical activity and nutrition long-term intervention project for youth, the Iowans Fit for Life Intervention (http://www.iowa.gov/iowansfitforlife/pilot_intervention/index.html).

The epidemiological aspects of this research showed a high prevalence of being overweight among Iowa youth and challenged the traditional view of a rural environment as being more conducive to physical activity than an urban environment. In addition, the research pathway of surveillance—theory/correlates research—intervention research is dependent on accurate measurement, thus the utility and validity of physical activity psychosocial correlate scales were examined in the context of increasing prevalence of overweight. Finally, the Youth Physical Activity Promotion Model, designed to examine social ecological correlates of youth physical activity (Welk, 1999), was further evaluated and refined.

What This Research Added

Study 1: Established the predictive utility of the Children's Physical Activity Correlates Scale (CPAC) for further use in youth physical activity research. This author's contribution to the initial manuscript included hierarchical linear modeling to account for the variation of schools, as well as initial testing of a mediating variable framework of parental influence, perceived competence, and attraction to physical activity. The results provided evidence to support the use of the CPAC in further research with youth physical activity. It also provoked questions about mediating variables and the influence of overweight in youth physical activity promotion.

Study 2: Provided epidemiological evidence of the high prevalence of overweight youth in Iowa and directed attention to a potential vulnerable population—rural youth. Study 2 was the first known study to examine physical activity at specific times of the day using the Physical Activity Questionnaire. The results of the study led to the selection of rural elementary youth as the target population of the Iowans Fit for Life Nutrition and Physical Activity Intervention conducted by the Iowa Department of Public Health. The results of the study will also provide a cohort comparison for the prospective five year intervention study.

Study 3: Provided new evidence regarding the lower self-esteem and negative physical self-perceptions of overweight adolescent boys. Previous research on adolescent boys used body mass index for classification of overweight and normal weight groups, which may have resulted in a misclassification of strong, muscular boys into the overweight category. The confounding effect of misclassification may have obscured the more negative self-perceptions that overweight adolescent boys experience. Study 3 also provided further validation of the Children and Youth Physical Self-Perception Profile among adolescents (regardless of weight status) as a measure of a very important psychosocial correlate of physical activity—physical self-perceptions. Finally, this study provided evidence that overweight prevalence in an urban, higher socio-economic Iowa school was lower than national and state rates.

Chapter 4: Study 1 of Chapter 4 showed that being overweight is associated with reduced global self-esteem, perceived competence, and attraction to physical activity, particularly for adolescent girls. Study 2 provided further validation and refinement of the

Youth Physical Activity Promotion Model for use as an evaluation framework for social ecological physical activity intervention research. Structural equation modeling further clarified a mediating variable framework that included the enabling, reinforcing, and predisposing factors that influence youth physical activity.

Future Opportunities and Recommendations

The results and limitations revealed in this research led to the following recommendations and opportunities:

- *Expand the Physical Activity and Nutrition Among Youth project or a similar surveillance system to all elementary, middle, and high school in Iowa.* Systematic training of professionals (e.g., nurses and/or physical education teachers) in established procedures of height and weight assessment, including the conveyance of non-judgmental attitudes, will allow an unbiased sample of evidence to be presented to policy-makers for use in funding decisions. The state-wide database of accurate anthropometric and physical activity assessments can also assist in evaluating interventions to increase physical activity.
- *Consider body composition measures rather than BMI when examining psychosocial correlates of physical activity.* Although BMI may be necessary for mass screenings, body composition measures may be necessary to accurately assess the effect of being overweight on psychosocial correlates of physical activity. The equivocal results of comparison of overweight and normal weight psychosocial correlates may be partially due to inaccurate assessments of overweight.
- *Replace the Global Self-esteem scale with the subscale of Body Attractiveness from the Children and Youth Physical Self-Perception Profile in the Youth Physical*

Activity Promotion model. The link between self-esteem and physical activity has been extensively examined and supported and is related to the positive mental health outcomes frequently cited as an essential reason for physical activity. While global self-esteem may be predictive of positive health behavior such as physical activity, it is also predictive of all healthy behaviors, including those in social, intellectual, and artistic arenas. However, a more specific predictor of the physical activity behavior may enhance the model and assist in determining interventions. The Children and Youth Physical Self-Perception Profile (CY-PSPP; Whitehead, 1995; Welk, Corbin, & Lewis, 1995) was included in the initial YPAP model, but was replaced due to the length of the CPAC battery of scales. Physical self-perceptions show a strong link between physical activity and self-esteem and also provide a potent predictor of physical activity behavior. The profile includes four sub-domain scales related to a higher-order variable of physical self-worth: body attractiveness, sport/athletic competence, strength competence, and physical conditioning adequacy. The sport, strength, and conditioning scales have similarities to Harter's perceived competence scale. The subscale most highly correlated with physical self-worth, Body Attractiveness, adds a dimension to the self-evaluative nature of the Perceived Competence latent variable in the YPAP model that is not encompassed in the global self-esteem scale used in this study.

- *Improve assessment of enabling factors.* The teacher surveys included much more information than physical education duration and time, which would enhance the construct validity of those items. Preliminary work on the tool to determine which items of the questionnaire will load most directly on youth physical activity should be continued (Joens-Matre & Welk, unpublished data). Furthermore, in this study, the model did not include an assessment of the community or home built environment. Those assessments will be necessary to fully examine the social ecological environment.

The United States Congress and the Department of Health and Human Services have provided funds for Iowa to develop nutrition and physical activity strategies to reduce obesity and its associated chronic diseases. As part of this funding, the Iowa Department of Public Health was charged with implementing a pilot intervention to increase physical activity and improve nutrition among a target population in Iowa. This author was the principal investigator of that study during the design and implementation of the Iowans Fit for Life Intervention. The Youth Physical Activity Promotion Model provided a framework in which to evaluate the 5 year intervention study. The intervention was applied at all levels of the social ecological model, thus the Youth Physical Activity Promotion Model will be a useful tool in evaluating health outcomes of that study.

The Iowans Fit for Life Intervention research will provide ample opportunity to further investigate the factors that are most effective in increasing physical activity and improving nutrition. The use of established measures and the addition of school and community assessments should enhance understanding of the most cost-effective ways to increase youth physical activity.

Addressing the public health crisis of youth obesity will require facilitation from enabling, reinforcing, and predisposing factors to allow opportunities for physical activity that ***youth*** enjoy. To that end, ***parents*** need to be empowered as to the importance of their influence. ***Policy-makers*** need to be convinced that quality physical education that improves perceived competence and encourages fun will require time, personnel, and funding in order for that to happen. And finally, ***community members*** need to be empowered to create more opportunities for physical activity in their neighborhoods. Being overweight does not change those basic tenets.

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APPENDIX

Background on the PANARY Study

The PANARY Project includes four components: (a) professional development, training and technical assistance to physical education teachers and other school personnel; (b) selection, development, and dissemination of healthy eating and physical activity resource materials to school administrators and program providers; (c) curriculum consultation; and (d) conducting school-based needs assessment, ongoing surveillance of dietary and physical activity behaviors of youth, and supporting research activities. Data collected in the project include a self-reported measure of physical activity (Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997; Kowalski, Crocker, & Faulkner, 1997a; Kowalski, Crocker, & Kowalski, 1997b)) complete fitness profiles through the *FITNESSGRAM* battery (Cooper Institute for Aerobics Research, 1999; Cooper Institute, 2004), and a battery of psychosocial correlates of physical activity (Welk, 1999; Welk, Wood, & Morss, 2003). Teachers are trained in the use of the *FITNESSGRAM* youth fitness assessment battery and *FITNESSGRAM* software across the project. Teachers track and record their data and submit their files electronically to the coordinating center for processing and data analyses.

The PANARY project includes students from 60+ schools from across the state of Iowa. The schools are located in diverse regions throughout the state, which helps to make the sample more representative of the overall population in the state (see Figure 2.1).

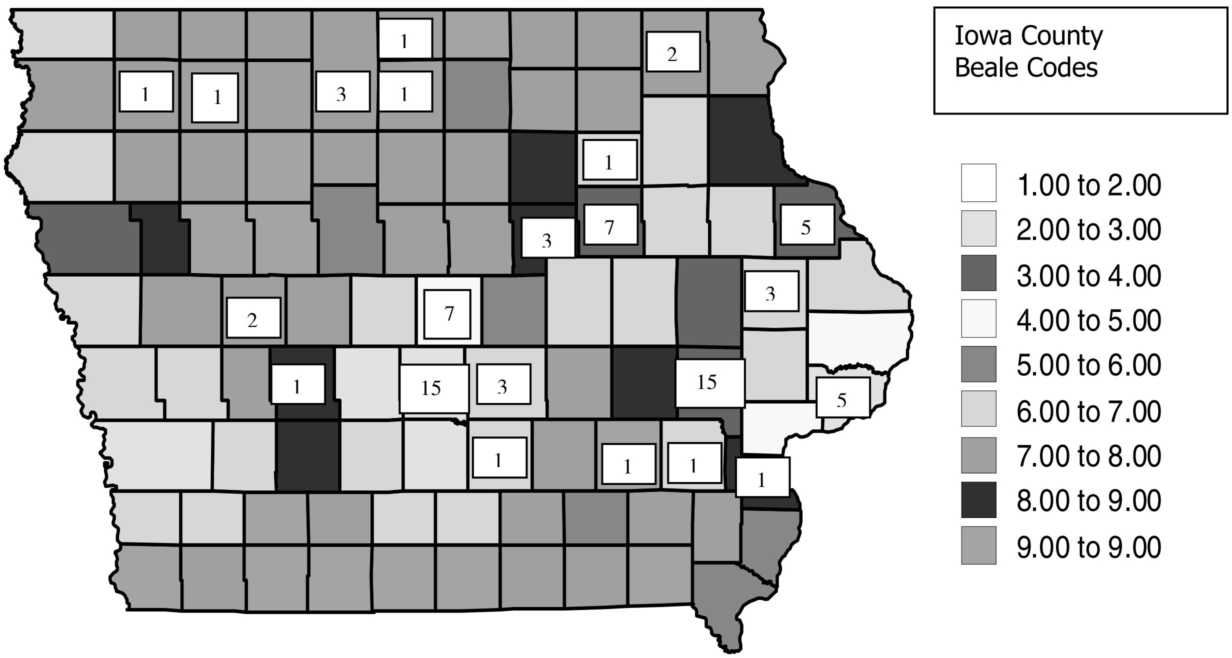

Figure 2.1. Distribution of Sample Schools by Beale Code Map Showing Urban and Rural Patterns in the State

Physical Activity Questionnaire for Children (PAQ-C)

The PAQ-C (Crocker et al., 1997; Kowalski et al., 1997a; Kowalski et al., 1997b) is designed to evaluate the child's activity in the last 7 days but can also be used to assess the child's "typical" level of physical activity. It uses a series of 10 questions that assess activity habits at different times of the day (both in and out of school, as well as on evenings and weekends). Each question is scored on a 1-5 scale and the average of all 10 items is used to represent the activity level of the child (note: for items 1 and 9, an average of the sub-items for that question is used for the score on that question). Thus, each question has an equal weight in the final score. While the score on the questionnaire does not provide a way to calculate time or calories spent in activity, it can be used to distinguish between active and inactive children or to demonstrate changes over time.

RAW VARIABLES IN SURVEY *

Q1a-Q1w	Q1PAQ1 (23 variables) – PA involvement in specific activities
Q2	Q2PAQ1 – activity in PE class
Q3	Q3PAQ1 – activity at lunch
Q4	Q4PAQ1 – activity after school
Q5	Q5PAQ1 – activity in the evening
Q6	Q6PAQ1 - activity on the weekend
Q7	Q7PAQ1 – typical PA
Q8a-Q8g	Q8PAQ1 – daily PA
Q9	Q9 – test PA variable
Q10	Q10 – extra PA variable on TV viewing

Note: Youth version has an additional question for activity in recess

Calculated Variables (7 variables)

Q1	mean (Q1a-Q1w)
Q8	mean (Q8a-Q8g)
PAQ	mean (Q1-Q8)

References

Crocker, P.R.E., Bailey, D.A., Faulkner, R.A., Kowalski, K.C., & McGrath, R. (1997). Measuring general levels of physical activity: preliminary evidence for the Physical Activity Questionnaire for older children. Medicine & Science in Sports and Exercise, 29(10), 1344-1349.

Kowalski, K.C., Crocker, P.R.E., & Faulkner, R.A. (1997a). Validation of the Physical Activity Questionnaire for older children. Pediatric Exercise Science, 9, 174-186.

Kowalski, K.C., Crocker, P.R.E., & Kowalski, N.P. (1997b). Convergent validity of the physical activity questionnaire for adolescents. Pediatric Exercise Science, 9, 342-352.

The Physical Activity Questionnaire for Children (PAQ-C) (Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997) is a general measure of a child's typical level of physical activity. This instrument uses nine questions to assess a child's physical activity in a variety of situations and times (e.g., school, recess, after school, evening, weekend etc…). Each item is scored on a 5 - point Likert scale with higher scores reflecting a greater level of physical activity. The average of the items is used as the activity level for the child. Thus, each question has an equal weight in the final score. This instrument has been found to have adequate test-retest reliability (range: r = .75 - .82) and reasonable validity (range: r = .45 - .53) when compared against other objective measures of physical activity (Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997; Kowalski, Crocker, & Faulkner, 1997).

A potential limitation of the instrument is that activity in short intervals of time (lunch, or recess) count as much as activity after school or on the weekends since each question has an equal weight. Another potential limitation is that the numerical scale (score from 1-5) does not provide a meaningful, or easily interpretable, unit of activity (i.e. minutes of activity or cal expenditure). Scores on the questionnaire, however can be used to clearly distinguish between active and inactive children. The instrument also creates a clear activity profile that may be helpful in identifying when children might be able to be more active. For example, if a child scores particularly low on activity after school, suggestions can be made for how the child might be more active at these times.

Reference List

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Kowalski, K. C., Crocker, P. R. E., & Kowalski, N. P. Convergent validity of the physical activity questionnaire for adolescents. Pediatric Exercise Science 9, 342-352. 1997.

Physical Activity Questionnaire

Now, we would like to find out about your level of physical activity in the past week (last 7 days). Physical activity refers to sports or dance that make you sweat or make your legs feel tired, or games that make you breathe hard like tag, running, climbing etc… There are no right or wrong answers. Please answer all the questions honestly and accurately.

1. Physical activity in your spare time: Have you done any of the following activities in the past 7 days (last week)? If yes, how many times (Mark only one circle per row.)

	No	1-2	3-4	5-6	7+
Skipping…………………..	O	O	O	O	O
Rowing/ canoeing………..	O	O	O	O	O
In-line skating…………….	O	O	O	O	O
Tag………………………..	O	O	O	O	O
Walking for exercise……..	O	O	O	O	O
Bicycling…………………	O	O	O	O	O
Jogging or running……….	O	O	O	O	O
Aerobics…………………	O	O	O	O	O
Swimming……………….	O	O	O	O	O
Baseball, softball………..	O	O	O	O	O
Dance……………………	O	O	O	O	O
Football…………………	O	O	O	O	O
Badminton………………	O	O	O	O	O
Skateboarding…………..	O	O	O	O	O
Soccer…………………..	O	O	O	O	O
Wrestling……………….	O	O	O	O	O
Volleyball………………	O	O	O	O	O
Floor hockey……………	O	O	O	O	O
Basketball………………	O	O	O	O	O
Ice skating……………	O	O	O	O	O
Cross-country skiing…..	O	O	O	O	O
Ice hockey/ice skating…	O	O	O	O	O
Other: _________________.......	O	O	O	O	O
_________________.......	O	O	O	O	O

2. In the last 7 days, during your physical education (PE) classes, how often were you very active (playing hard, running, jumping, throwing)? (check one only.)

I didn't do PE……………………………………	O
Hardly ever……………………………………..	O
Sometimes………………………………………	O
Quite Often……………………………………..	O

Always……………………………………………   O

3. In the last 7 days, what did you normally do *at lunch* (besides eating lunch)? Check one only.)

Sat down (talking, reading, doing school work)…   O
Stood around or walked around………………….   O
Ran or played a little bit…………………………   O
Ran around and played quite a bit……………….   O
Ran and played hard most of the time…………..   O

4. In the last 7 days, on how many days *right after school,* did you do sports, dance or play games in which you were very active? (Check only one.)

None……………………………………………..   O
1 time last week………………………………….   O
2 or 3 times last week……………………………   O
4 times last week………………………………...   O
5 times last week…………………………………   O

5. In the last 7 days, on how many *evenings* did you do sports, dance, or play games in which you were active? (Check one only.)

None……………………………………………..   O
1 time last week………………………………….   O
2 or 3 times last week……………………………   O
4 times last week………………………………...   O
5 times last week…………………………………   O

6. During *the last weekend*, how many times did you do sports, dance, or play games in which you were very active? (Check only one.)

None……………………………………………..   O
1 time ………..…………………………………..   O
2 - 3 times………… ……………………………   O
4 – 5 times……..………………………………...   O
6 or more times. …………………………………   O

7. Which *one* of the following describes you best for the last 7 days? Read *all five* statements before deciding on the *one* answer that describes you.
   a. All or most of my free time was spent dong things that involve little physical effort…………………………………..........   O

b. I sometimes (1-2 times last week) did physical things in my free time (e.g. played sports, went running, swimming, bike riding, did aerobics)………………………………………… O

c. I often (3-4 times last week) did physical things in my free time ………………………………………………………… O

d. I quite often (5-6 times last week) did physical things in my free time …………………………………………………… O

e. I very often (7 or more times last week) did physical things in my free time …………………………………………….. O

8. Mark how often you did physical activity (like playing sports, games, doing dance, or any other physical activity) for each day last week.

	None	Little bit	Medium	Often	Very Often
Monday…………	O	O	O	O	O
Tuesday…………	O	O	O	O	O
Wednesday………	O	O	O	O	O
Thursday………..	O	O	O	O	O
Friday…………..	O	O	O	O	O
Saturday………..	O	O	O	O	O
Sunday…………	O	O	O	O	O

9. Were you sick last week, or did anything prevent you from dong your normal physical activities? (Check one.)

Yes…………………………… O

No……………………………. O

If yes, what prevented you? ______________________________________

10. On a typical school day, how many total hours outside of school do you watch TV, view videos, or work/play on the computer? Circle your answer.
   a. I do not watch TV, view videos or use the computer on a typical day
   b. Less than 1 hour per day
   c. 1 hour per day
   d. 2 hours per day
   e. 3 hours per day
   f. 4 or more hours per day

Correlates of Physical Activity in Children's (CPAC) - codebook

The Physical Activity Correlates (PAC) instrument includes 44 items that assess various psychosocial correlates of physical activity in children. The instrument combines items from a number of other validated scales into one instrument that can be used to evaluate correlates of physical activity in children. The instrument includes 15 items from the Children's Attraction to Physical Activity (CAPA) scale (1), 5 items from Harter's perceived competence scale (2), 6 items from Rosenberg's self-esteem scale and 18 items from a parent socialization scale (Welk).

The instrument uses a "structured alternative format" to decrease the tendencies for socially acceptable responses. To administer the instrument, it is important to first explain the format to the children. Read the sample question to the children and ask them to decide which of the two kids they are most like. Once they pick a side, they should decide whether it is really true for them or just somewhat true for them. Once they understand the format you can let children complete the assessment on their own (for students in 5^{th} grade or higher) or read it to them.

Because some of the responses are "reverse" coded, they need to be recoded when the data are processed. Variables recoded to make 4 most positive: 1,3,5,7,8,9,11,12,13,16,17,18,20,22,24, 25,27,28,29,32,34,36,38,39,40,42,43,44. Once the data are collected, the mean scores for the scales need to be calculated.

Calculated Variables:

LikeGame	mean (1,3,24)	Liking of games & sports (CAPA)
FunExert	mean (2,21,31)	Fun of physical exertion (CAPA)
LikeExer	mean (4,15,30)	Liking of Exercise (CAPA)
ImpExer	mean (16,22,26)	Importance of Exercise (CAPA)
PeerAcc	mean (6,10,27)	Peer acceptance (CAPA)
PerComp	mean (8,17,29,35,39)	Perceived competence (Harter)
SE	mean (7,12,34,37,41,42)	Self Esteem (Rosenberg)
ParRole	mean (5,13,28,33,38,43)	Perceptions of parental role modeling
ParSup	mean (9,11,14,18,19,25)	Perceptions of parental support
ParEnc	mean (20,23,32,36,40,44)	Perceptions of parental encouragement

Summary Variables:

ParInf	mean (ParEnc, ParInv, ParFac)
Attract	mean (LikeGame, FunExert, LikeExer, ImpExer, PeerAcc)

Reference List

1. Brustad RJ. Who will go out and play? Parental and psychological influences on children's attraction to physical activity. Pediatric Exercise Science 1993;5:210-23.

2. Harter S. The perceived competence scale for children. Child Development 1982;53:87-97.

The following questions ask you about your interests in physical activity.
Instructions:

Please read the sample question below.
Decide which of the two children is most like you. (A or B)
Once you pick a side, decide whether this is "really true" or just "sort of true".
Please choose only one answer. Remember there are no right or wrong answers, simply choose the one that is best for you.

	Really true for me	***Sort of true for me***	**SAMPLE**	***BUT***	**SAMPLE**	***Sort of true for me***	***Really true for me***
		X	**Some kids like to eat ice cream more than anything else.**		**Other kids like other foods more than ice cream**		
1.			*Some kids like playing outdoor games and sports.*	***BUT***	*Other kids would rather play indoors.*		
2.			*Some kids don't like getting sweaty when they exercise or play hard.*	***BUT***	*Other kids don't mind getting sweaty when they exercise or play hard.*		
3.			*Some kids have more fun playing games and sports than anything else.*	***BUT***	*Other kids like doing other things rather than playing games and sports.*		
4.			*Some kids don't like to exercise very much.*	***BUT***	*Other kids like to exercise a whole lot.*		
5.			*Some kids have parents who get a lot of exercise.*	***BUT***	*Other kids have parents who don't get a lot of exercise.*		
6.			*Some kids get told by other kids that they are not very good at games and sports.*	***BUT***	*Other kids are told that they are good at games and sports.*		

7.			*Some kids are happy with themselves as a person.*	***BUT***	*Other kids are often unhappy with themselves as a person.*		
8.			*Some kids do very well at all kinds of games and sports.*	***BUT***	*Other kids don't feel very good when it comes to games and sports.*		
9.			*Some kids have parents who let them play on community or school sport teams.*	***BUT***	*Other kids have parents who don't let them play on school or community sport teams.*		
10.			*Some kids get teased by other kids when they play games and sports.*	***BUT***	*Other kids don't get teased when they play games and sports.*		
11.			*Some kids have parents who play games and sports with them.*	***BUT***	*Other kids have parents who don't play games and sports with them.*		
12.			*Some kids are happy being the way they are now.*	***BUT***	*Other kids wish they were different.*		
13.			*Some kids have parents who are in really good shape.*	***BUT***	*Other kids have parents who aren't in such good shape.*		
14.			*Some kids have parents that don't help them much with sports.*	***BUT***	*Other kids have parents that help them a lot with sports.*		
15.			*Some kids don't enjoy exercise very much.*	***BUT***	*Other kids enjoy exercise a whole lot.*		

16.			*Some kids try hard to stay in good shape.*	***BUT***	*Other kids don't try hard to stay in good shape.*		
17.			*Some kids feel they are better than other kids their age at games and sports.*	***BUT***	*Other kids don't feel they can play as well as other kids their age at games and sports.*		
18.			*Some kids have parents who buy them a lot of sports equipment.*	***BUT***	*Other kids have parents who don't buy them much sports equipment.*		
19.			*Some kids have parents who don't take them to parks or playgrounds.*	***BUT***	*Other kids have parents who take them to parks and playgrounds a lot.*		
20.			*Some kids have parents who tell them that they are good a t games and sports.*	***BUT***	*Other kids have parents who tell don't tell them that they are good at games and sports.*		
21.			*Some kids don't like getting out of breath when they play hard.*	***BUT***	*Other kids don't mind getting out of breath when they play hard*		
22.			*Some kids have parents that don't encourage them to play outside.*	***BUT***	*Other kids have parents who frequently encourage them to play outside.*		
23.			*For some kids, games and sports is their favorite thing.*	***BUT***	*Other kids like other things more than games and sports.*		
24.			*Some kids think it is very important to be in good shape.*	***BUT***	*Other kids don't think it is very important to be in good shape.*		

25 .			*Some kids have parents that practice games and sports skills with them a lot.*	***BUT***	*Other kids have parents that don't practice games and sports skills with them very much.*		
26 .			*Some kids don't think that exercise is important for their health.*	***BUT***	*Other kids think that exercise is very important for their health.*		
27 .			*Some kids are popular with other kids when they play games and sports.*	***BUT***	*Other kids are not very popular with the other kids when they play games and sports.*		
28 .			*Some kids have parents that like to walk for exercise.*	***BUT***	*Other kids have parents that don't like to walk for exercise.*		
29 .			*Some kids are pretty sure that they are a good athlete.*	***BUT***	*Other kids don't think that they are a good athlete.*		
30 .			*Some kids really don't like to exercise.*	***BUT***	*Other kids do like to exercise.*		
31 .			*Some kids feel bad when they run hard.*	***BUT***	*Other kids feel good when they run hard.*		
32 .			*Some kids have parents who want hem to play outside.*	***BUT***	*Other kids have parents who usually wan them to play inside.*		
33 .			*Some kids have parents who don't like to do much physical activity.*	***BUT***	*Other kids have parents that like to do a lot of physical activities.*		

34 **.**			*Some kids are happy being the way they are.*	***BUT***	*Other kids wish they were different.*		
35 **.**			*Some kids don't do well at new games and sports.*	***BUT***	*Other kids are good at new games and sports right away.*		
36 **.**			*Some kids have parents that tell them not to watch too much TV.*	***BUT***	*Other kids have parents that let the watch TV as much as they want.*		
37 **.**			*Some kids are often unhappy with themselves.*	***BUT***	*Other kids are usually pleased with themselves.*		
38 **.**			*Some kids have parents that usually walk or bike a lot.*	***BUT***	*Other kids have parents who don't walk or bike much.*		
39 **.**			*Some kids are good at most games and sports.*	***BUT***	*Other kids aren't much good at games and sports.*		
40 **.**			*Some kids have parents who remind them to do some physical activity.*	***BUT***	*Other kids have parents that don't remind them much about physical activity.*		
41 **.**			*Some kids are not happy with the way they do a lot of things.*	***BUT***	*Other kids think that the way they do things is just fine.*		
42 **.**			*Some kids like the kind of person they are.*	***BUT***	*Other kids often wish they were someone else.*		

43.			*Some kids have parents that would rather walk to the store if possible.*	***BUT***	*Other kids have parents who will always drive a car instead of walking.*		
44.			*Some kids have parents who encourage them to try hard at games and sports.*		*Other kids have parents who don't encourage them very much at games and sports.*		

The Physical Self-Perception Profile (PSPP)

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The PSPP instrument contains 44 items that assess a person's perceptions of their physical self. There are 4 scales of the PSPP (Sport, Cond, Body, Strong) that assess specific dimensions of the physical self and these have been shown to be independent factors. The impact of these perceptions on a person's physical self worth (PSW) and Self-Esteem (SE) will depend on how important they are to the specific individual. For example, if a person doesn't value sport ability then low perceptions in this area will not affect physical self worth or self-esteem. These importance ratings are labeled as Sport PI, Cond PT, Body PI and Strong PI.

The items in the PSPP use a "structured alternative format" to decrease the tendencies for socially acceptable responses. Read the sample question "Some kids would rather play outdoors in their spare time but other kids would rather watch TV". Ask the students to decide which of those two kids they are most like. Once they pick a side, they should decide whether it is really true for them or just somewhat true for them. Once they understand the format you can let children complete the assessment on their own.

Because some of the responses are "reverse" coded, they need to be recoded when the data is processed. Variables recoded to make 4 most positive: 1,3,5,8,10,12,13,15,17, 20,21,22,24,25,27,29,30,32,34,37,38,39, 42, 44.

Once the data is collected, the mean scores for the scales need to be calculated. The formulas are below:

Sport	mean (P1,P7,P13,P19,P25,P31)	Sport
Cond	mean (P2,P8,P14,P20,P26,P32)	Condition
Body	mean (P3,P9,P15,P21,P27,P33)	Body
Strong	mean (P4,P10,P16,P22,P28,P34)	Strong

PSW	mean (P5,P11,P17,P23,P29,P35)	Physical Self Worth
SE	mean (P6,P12,P18,P24,P30,P36)	Self Esteem
Sport PI	mean (P37,P41)	Perceived importance of sport
Cond PI	mean (P38,P42)	Perceived importance of cond
Body PI	mean (P39,P43)	Perceived importance of body
Strong PI	mean (P40,P44)	Perceived importance of strong

Reference List

Eklund, R.C., Whitehead, J.R., & Welk, G.J. (1997). Validity of the Children and Youth Physical Self-Perception Profile: A confirmatory factor analysis. Research Quarterly for

The following questions ask you about your interests in physical activity.
Instructions:

Please read the sample question below.
Decide which of the two children is most like you. (A or B)
Once you pick a side, decide whether this is "really true" or just "sort of true".
Please choose only one answer.
Remember there are no right or wrong answers, simply choose the one that is best for you.

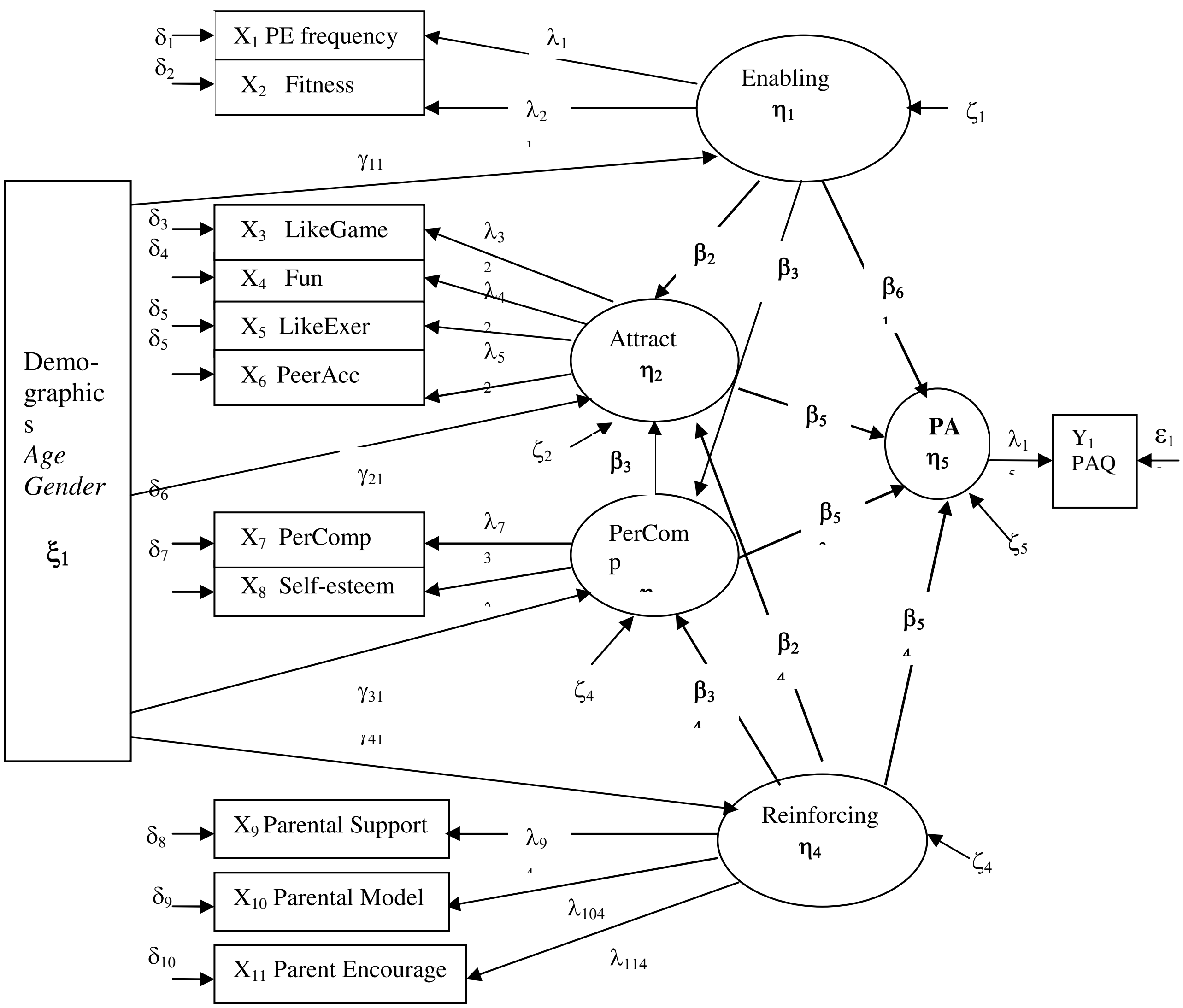
	Really true for me	***Sort of true for me***	**SAMPLE**	***BUT***	**SAMPLE**	***Sort of true for me***	***Really true for me***
		X	**Some kids would rather play outdoors in their spare time**		**Other kids would rather watch T.V.**		
1.			*Some kids do very well at all kinds of sports*		*Other kids* don't *feel that they are very good when it comes to sports*		
2.			*Some kids feel* uneasy *when it comes to doing vigorous physical exercise*	***BUT***	*Other kids feel* confident *when it comes to doing vigorous physical exercise*		
3.			*Some kids feel that they have a good-looking (fit-looking) body compared to other kids*	***BUT***	*Other kids feel that compared to most, their body* doesn't *look so good*		
4.			*Some kids feel that they* lack *strength compared to kids their age*	***BUT***	*Other kids feel that they are stronger than other kids their age*		
5.			*Some kids are* proud *of themselves physically*	***BUT***	*Other kids* don't *have much to be proud of physically*		
6.			*Some kids are often* unhappy *with themselves*	***BUT***	*Other kids are pretty* pleased *with themselves*		
7.			*Some kids wish they could be a lot better at sports*	***BUT***	*Other kids feel that they are good enough at sports*		
8.			*Some kids have a lot of stamina for vigorous physical exercise*	***BUT***	*Other kids soon get out of breath and have to slow down or quit*		

9.			*Some kids find it* difficult *to keep their bodies looking good physically*	***BUT***	*Other kids find it* easy *to keep their bodies looking good physically*		
10.			*Some kids think that they have stronger muscles than other kids their age*	***BUT***	*Other kids feel that they have weaker muscles than other kids their age*		
11.			*Some kids* don't *feel very confident about themselves physically*	***BUT***	*Other kids really feel good about themselves physically*		
12.			*Some kids are* happy *with themselves as a person*	***BUT***	*Other kids are often* not *happy with themselves*		
13.			*Some kids think they could do well at just about any new sports activity they haven't tried before*	***BUT***	*Other kids are aftraid they night* not *do well at sports they haven't ever tried*		
14.			*Some kids* don't *have much stamina and fitness*	***BUT***	*Other kids have* lots *of stamina and fitness*		
15.			*Some kids are* pleased *with the appearance of their bodies*	***BUT***	*Other kids wish that their bodies looked in better shape physically*		
16.			*Some kids* lack *confidence when it comes to strength activities*	***BUT***	*Other kids are very confident when it comes to strength activities*		
17.			*Some kids are very* satisfied *with themselves physically*	***BUT***	*Other kids are often* dissatisfied *with themselves physically*		
18.			*Some kids* don't *like the way they are leading their life*	***BUT***	*Other kids* do *like the way they are leading their life*		
19.			*In games and sports some kids usually* watch *instead of play*	***BUT***	*Other kids usually* play *rather than watch*		
20.			*Some kids try to take part in energetic physical exercise whenever they can*	***BUT***	*Other kids try to avoid doing energetic exercise if they can*		
21.			*Some kids feel that they are* often *admired for their good-looking bodies*	***BUT***	*Other kids feel that they are* seldom *admired for they way their bodies look*		
22.			*When strong muscles are needed, some kids are the* first *to step forward*	***BUT***	*Other kids are the* last *to step forward when strong muscles are needed*		
23.			*Some kids are* unhappy *with how they are and what they can do physically*	***BUT***	*Other kids are* happy *with how they are and what they can do physically*		

24.			Some kids like the kind of person they are	***BUT***	Other kids often wish they were someone else		
25.			Some kids feel that they are better than others their age at sports	***BUT***	Other kids don't feel they can play as well		
26.			Some kids soon have to quit running and exercising because they get tired	***BUT***	Other kids can run and do exercises for a long time without getting tired		
27.			Some kids are confident about how their bodies look physically	***BUT***	Other kids feel uneasy about how their bodies look physically		
28.			Some kids feel that they are not as good as others when physical strength is needed	***BUT***	Other kids feel they are among the best when physical strength is needed		
29.			Some kids have a positive feeling about themselves physically	***BUT***	Other kids feel somewhat negative about themselves physically		
30.			Some kids are very happy being the way they are	***BUT***	Other kids wish they were different		
31.			Some kids don't do well at new outdoor games	***BUT***	Other kids are good at new games right away		
32.			When it comes to activities like running, some kids are able to keep on going	***BUT***	Other kids soon have to quit to take a rest		
33.			Some kids don't like how their bodies look physically	***BUT***	Other kids are pleased with how their bodies look physically		
34.			Some kids think that they are strong, and have good muscles compared to other kids their age	***BUT***	Other kids think that they are weaker, and don't have such good muscles as other kids their age		
35.			Some kids wish that they could feel better about themselves physically	***BUT***	Other kids always seem to feel good about themselves physically		
36.			Some kids are not very happy with the way they do a lot of things	***BUT***	Other kids think the way they do things is fine		
37.			Some kids think it's important to be good at sports	***BUT***	Other kids don't think its important to be good at sports		
38.			Some kids don't think having a lot of stamina for energetic exercises is very important to how they feel	***BUT***	Other kids think that having a lot of stamina for vigorous exercise is very		

			about themselves		*important*		
39.			*Some kids think it's* very *important to have a good-looking (fit-looking) body in order to feel good about themselves as a person*	***BUT***	*Other kids* don't *think that having a good-looking body is important at all*		
40.			*Some kids think that being physically strong is* not *all that important to how they feel about themselves as a person*	***BUT***	*Other kids feel that it's* very *important to be physically strong*		
41.			*Some kids* don't *think doing well at athletics is that important to how they feel about themselves as a person*	***BUT***	*Other kids feel that doing well at athletics is important*		
42.			*Some kids feel that having the ability to do a lot of running and exercising is* very *important to how they feel about themselves as a person*	***BUT***	*Other kids* don't *feel it's all that important to have the ability to do a lot of running and exercising*		
43.			*Some kids* don't *think that having a body that looks in good physical shape is important to how they feel about themselves*	***BUT***	*Other kids feel that it's* very *important to have a body that looks in good physical shape*		
44.			*Some kids think that having strong muscles is* very *important to how they feel about themselves*	***BUT***	*Other kids feel that it's* not *important to have strong muscles*		

Youth Physical Activity Promotion Model (structural equation model)



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