

The Role of Physical Education in the Promotion of Youth Physical Activity

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Physical education can be a powerful influence on promoting youth physical activity (PA). This review describes correlates of youth PA, examines how these factors have been targeted in physical education (PE) based interventions, and makes suggestions for PE pedagogy to promote PA. Perceived physical competence, enjoyment of PA, intention, direct help and support from parents and significant others, and opportunities to be active were consistently associated with youth PA. The large-scale PE-based PA promotion programs that were successful in increasing out-of-school PA applied a pedagogical framework targeting variables associated with motivation (i.e., perceived competence, enjoyment of PA, self-determination). PE based interventions should continue to address the nature of activities, but also utilize pedagogy that promotes psychological determinants of student motivation.

The Surgeon General's "Call to Action to Prevent and Decrease Overweight and Obesity" (USDHHS, 2001) points to increases in levels of adiposity in America's youth and the rapid rise of obesity in children and adolescents. Results from the National Health and Nutrition Examination Survey (NHANES, 2000), using measured heights and weights, indicate that since 1988 there has been an estimated 30% increase in the number of children and adolescents ages 6-19 years who are overweight in the U.S. (NHANES II). Obesity in youth is associated with an increased risk of type-II diabetes (Goran, 2001); glucose intolerance, hyperlipidemia (Dietz, 1998); hypertension (Baskin, Ahluwalia, Resnicow, 2001); and social discrimination and altered self-esteem (Wabitsch, 2000). Emerging evidence indicates that physical activity is beneficial to the health of children and adolescents (USDHHS, 1996). Among youth, physical activity is inversely associated with obesity and a number of cardiovascular risk factors (Sallis & Patrick, 1994). Moreover, because physical activity habits developed early in life may persist into childhood (Telama, Yang, Laakso, & Vilkarı 1997), adequate participation in physical activity during childhood and adolescence may also be critical in the prevention of obesity and chronic disease in later life.

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Physical education can be an important means by which the level of physical activity can be affected. In fact, Sallis and McKenzie (1991) argued that positive student motivation in physical education could influence children to adopt physically active lifestyles as adults. During the last decade, Sallis and McKenzie's (1991) assertion has provided the rationale for an abundance of research (e.g., Ntoumanis, 2001; Solmon, 1996; Treasure & Roberts, 2001) designed to investigate student motivation in physical education. The basic premise of this research is that if physical educators are able to increase students' perceived competence and subsequent enjoyment of their experiences in physical education, these affective outcomes of physical education will transfer into motivation to adopt a physically active lifestyle out of school. This assumption is based on theory and research that suggest that the experience of enjoyment is a critical factor in determining one's motivation for and continued participation in exercise settings (Kremer, Trew, & Ogle, 1997). Harter's competence motivation theory (Harter, 1981; Klint & Weiss, 1987) suggests that enjoyment of physical activity is a result of successful mastery experiences, which lead to a bolstered perceived competence. Several studies (e.g., Hyams, Carruthers, Busser, & Tandy, 1995; Telama, 1998) have shown a significant positive relationship between perceived competence and participation in physical activity.

Although the assertion that physical education plays a critical role in the promotion of youth physical activity is inherently appealing to many pedagogues, a closer inspection of the pedagogy literature reveals a dearth of research that has investigated the effects of physical education on physical activity outside the school environment. Youth physical activity is influenced by a multitude of psychological, biological, social, cultural, and environmental factors that may affect an individual's decision to adopt and maintain a physically active lifestyle (Buckworth & Dishman, 2002). Physical education may indeed be a powerful factor in determining youth physical activity, but the causal linkage between students' experience and attitudes toward physical education and their adoption of a physically active lifestyle has yet to be determined. Further investigation is required to validate Sallis and McKenzie's (1991) claim that positive experiences in physical education in childhood could influence the adoption of active lifestyles as adults. Further evidence must be provided that physical education curricular programs can foster positive changes in student motivation toward physical activities, such that this motivation is a significant determinant of the students' participation in a more physically active lifestyle out of school.

The aims of this paper are threefold. The first aim is to identify, from contemporary youth physical activity research, strong, consistent, and modifiable correlates of physical activity. The second aim is to summarize and critique the variables that have been targeted in large-scale physical activity promotion programs that have utilized a physical education curriculum intervention for their association with high levels of youth physical activity. Finally, from this critique, suggestions for making physical education interventions more effective in promoting youth physical activity will be presented.

Correlates of Youth Physical Activity

There have been several summaries of correlates of PA in adults (e.g., Sallis & Owen, 1999) with a more recent update published in 2002 (Trost, Owen, Bauman,

Sallis, & Brown, 2002). A comprehensive review of studies of correlates of youth physical activity published from 1970 to 1999 was conducted by Sallis, Prochaska, and Taylor (2000). The review utilized a semi-quantitative evaluation of the results of over 100 studies that encompassed young people within the 3-18 years age range and also compared results for young people of elementary and secondary school ages. In order to summarize the strength of association between variables and level of physical activity a criteria was used based upon percentage of studies that supported the variable as a strong correlate of physical activity. Each variable was classified as the following: no association (0-33%), indeterminate/inconsistent (34-59%), positive or negative association (60-100%).

There is very little overlap in consistently correlated variables for both age groups (Sallis et al., 2000). A synthesis of the Surgeon General's report on physical activity for youth (USDHHS, 1996) and the Sallis et al. (2000) review reveals that the most consistent, modifiable correlates of physical activity were perceived physical competence, enjoyment of physical activity, intention, direct help and support from parents and significant others, and opportunities to be active. This synthesis lends initial support to the contemporary theories described by Klint and Weiss (1987) and Kremer et al. (1997) that emphasize the critical role perceived competence and enjoyment play in children's motivation to continue to participate in physical activities. Of the correlates investigated by Sallis et al. (2000), about 20-28% of variables were placed in the indeterminate category. The variable of attitude toward physical education was classified as indeterminate in its association with youth physical activity. However, within Sallis et al.'s (2000) review, the authors state that "it is particularly difficult to draw conclusions about these variables as the lack of consistency in findings could be due to differences in measurement or sample. There also may be confounding or moderating variables that need to be accounted for in analyses" (p. 970).

In order to further examine the variable of student attitude toward physical education on youth physical activity, a more detailed analysis of each of the specific studies utilizing a specific "physical education variable" within the Sallis et al. (2000) review was conducted. Each study was analyzed, not only from a measurement perspective, but also for its implication for the physical education community. Table 1 summarizes the sample, aims, measurement, and results of each of the studies reviewed by Sallis et al. (2000) that utilized a measure of attitude toward physical education.

Measurement Issues

The contributions of research to understanding the effects of physical education on youth physical activity must be considered in respect to the accuracy of the measurement of physical activity and psychosocial constructs. Dishman, Washburn, and Schoeller (2001) highlight the challenge researchers face in accurately measuring physical activity in free-living populations. Although many direct or indirect methods exist to assess physical activity, investigators interested in trying to understand patterns of exercise adherence and physical activity over time require measures that are unobtrusive, practical to administer, and specific about the type, frequency, duration, and intensity of physical activity. Table 1 reveals that all five of the correlational studies of physical activity and attitude toward physical education within the Sallis et al. (2000) review utilized a self-report measure of physical activity.

Table 1 Summary of the Studies Within the Sallis et al. (2000) Review That Utilized an Attitude to Physical Education Measure

Study	Sample	Aims	Measurement	Results
Butcher (1983)	661 female students, grades 6-10.	To examine variables that influence the socialization of adolescent girls into physical activity.	PA- Self-report of the following: Number of interschool teams, intramural activities, community-organized activities, total number of activities, average hours per day spent in physical activity, frequency of participation in four favorite activities PE single author-constructed item assessing satisfaction with physical education	<ul style="list-style-type: none"> • Average hours per day of physical activity showed a consistent decline in value over the five grades. • School-related physical activity variables such as number of school teams and intramural activities were most related to satisfaction with sport skills and to self-confident, assertive self-descriptions. • Involvement in community-organized activities was most related to parental socialization influence and SES. • Satisfaction with physical education had low correlation with participation variables
Ferguson et al. (1989)	603 students grades 6-8	To determine whether students' attitudes toward exercise, physical education, and beliefs about themselves were related to current exercise behavior and intent to exercise	PA Self-report of how often exercise per week, single item on intent to exercise. PE 2 items assessing attitudes toward physical education	<ul style="list-style-type: none"> • Perceived benefits of exercise, self-esteem, perceived athletic ability and attitudes to PE correlated to intent • Same variables significantly correlated to current exercise behavior except attitude to PE

Zakarian et al. (1994)	1634 students, grades 9-11.	Use of social learning theory to investigate determinants of physical activity in multi-ethnic high school age students	PA Self-report of frequency of weekly involvement in bouts of vigorous physical activity outside school + frequency of vigorous activity within PE lessons PE attitude – single item assessing “liking” of physical education.	<ul style="list-style-type: none"> Higher overall rates of vigorous exercise for 9th grade due, in part, to required participation in PE classes Self-efficacy strong correlates of participation in vigorous exercise for both males and females For females, negative attitude to PE predicted participation in vigorous exercise.
Trost et al. (1997)	202 students, grade 5	Examine the predictors of vigorous and moderate physical activity among a cohort of rural, predominantly African-American children	PA Self-report previous day physical activity recall PE single item like/dislike of physical education	<ul style="list-style-type: none"> 26% Girls VPA predicted by participation in community team sports, self-efficacy in overcoming barriers, enjoyment of PE, race, mother’s activity level. 5% Boys VPA predicted by self-efficacy to overcome barriers. 17% girls MVPA predicted by self-efficacy in overcoming barriers, number of community sports teams. 17% boys MVPA predicted by beliefs about physical activity outcomes, number of community sports teams
Sallis et al. (1999)	732 students, grades 4 & 5	Explain change in physical activity over 2 academic years in subgroups of children defined on the basis of gender and adiposity	PA One-day recall, accelerometer, parent report PE 3 item semantic differential scale assessing attitude toward PE	<ul style="list-style-type: none"> Decline in PA for both boys (3-6%) and girls (7-12%) over 20-month period Significant psychological change variables were PE attitude, perceived activity competence, activity preference.

In a recent summary of the issues surrounding the measurement of physical activity, Dishman et al. (2001) suggested that, "on balance, self-report of physical activity offers the most practical and cost-effective method for use in population based studies" (p. 295). However, Sallis and Owen (1999) take the position that self-reported physical activity should not be used with children younger than 9 or 10 years and used cautiously with adolescents up to the age of 15 years. Dishman et al. (2001) postulated that "physical activity is a multidimensional behavior and no single assessment method can capture all of its dimensions so therefore the use of multiple methods can contribute to the understanding of the relationship between techniques" (p. 309). Of the five studies detailed in Table 1, only the Sallis et al. (1999) study utilized a multimethod approach to assessing physical activity, including both self-report (one-day recall) and objective (accelerometer) measures.

There are several measurement-related concerns regarding the assessment of student attitudes toward physical education in the studies detailed in Table 1. Silverman and Subramaniam (1999), in a recent review of issues relating to the measurement of student attitude toward physical education and physical activity, highlight the need for studies within this domain to utilize psychometric theory in order to determine and present both the validity and reliability of the instruments used to assess the attitude variable. Silverman and Subramaniam (1999) suggest that, "when information on the reliability and validity of an instrument is not provided, the reader is unable to make decisions about the strength of the instrument and the worth of the data may be questioned" (p.105). None of the five studies presented in the Sallis et al. (2000) review (Table 1) either reported or specified the procedures undertaken to establish the validity of the attitude to physical education subscale utilized. Within all five studies, the physical education construct was assessed with a minimal number of self-report items (less than three). Although attitude to physical education was one of many variables investigated, reducing the number of items employed to assess a construct to less than three has major implications for the reliability of the subscale. The two studies (Ferguson, Yesalis, Promrehn, & Kirkpatrick, 1989; Sallis, Alcaraz, McKenzie, & Hovell, 1999) that assessed attitude toward physical education using multiple items also reported the reliability of the subscale. In three (Butcher, 1983; Zakarian, Hovell, Hofstetter, Sallis, & Keating, 1994; Trost et al., 1997) of the five studies, however, only a single item was employed to assess the construct of attitude/liking of physical education. The use of only a single item rating scale to represent a construct limits our ability to analyze and interpret that construct due to its ordinal level of measurement (Hopkins, Hopkins, & Glass, 1996). Only by having multiple items does a summated scale approach interval in its level of measurement and so warrants the use of descriptive statistics, such as mean and standard deviation.

Within all of the five studies the assessment of attitude toward physical education was also restricted solely to measurement of the affective dimension, or the degree of emotional attraction or feeling toward physical education. Mohsin (1990) points out that this approach of investigating attitude from a unidimensional perspective is problematic, since, in reality, attitude is a multidimensional latent construct consisting of cognitive, affective, and behavioral dimensions. Investigating attitude toward physical education using a single-factor model, such as the

ones employed within the reviewed studies, could result in effectively measuring only the affective part of the attitude and ignoring the cognitive or belief structures, which explain the affective response.

Summary of the Results of the Correlational Studies

Despite some of the measurement concerns associated with physical activity and the constructs of interest within the specific studies, the results of these studies reveal some consistent patterns of youth physical activity and the correlates most strongly predictive of physical activity. The findings from three of the studies (Butcher, 1983; Zakarian et al., 1994; Sallis et al., 1999) show that as children progress into adolescence and toward the end of their school years, their level of physical activity declines. Sallis et al. (1999) demonstrated that, on average, a 3-6% decrease for boys and 7-12% decrease for girls in physical activity occurred during only a 20-month period through the 4th and 5th grades. This trend of decline in physical activity seen in late childhood seems to continue through 6th to 10th grade (Butcher, 1983) and into school graduation age (Zakarian et al., 1994). Data from the Youth Risk Behavior Surveys seems to suggest that for females, a decrease in levels of vigorous activity has contributed to this overall decline in physical activity (Lowry, Wechsler, Kann, and Collins, 2001). Zakarian et al. (1994) proposes this decline in vigorous activity during late adolescence is partly explained by the decrease in required participation in physical education during the graduation years. Lowry and colleagues (2001), in examining data trends from the Youth Risk Behavior Surveys (1991 - 1997), found that although PE enrollment in the total population did not change from 1991 (49%) to 1997 (49%), the prevalence of students who attended PE daily decreased significantly. The prevalence of students who were physically active > 20 minutes in daily physical education classes also decreased from 34% in 1991 to 22% in 1997 ($p < .001$; Lowry et al., 2001). Due to the limitations of the physical activity assessment instrument utilized within the YRBS (self-report, recall of behavior for the previous seven days), some caution should be taken in interpreting the results.

The decreased emphasis on requiring students to participate in physical education during 11th and 12th grades does not satisfy the Healthy People 2010 (USDHHS, 2000) objective of daily physical education. The trend to reduce the physical education requirement with advancing grade is consistent with the premise that students would be taught activities during early high school that they would then continue with, even when not participating in regular physical education. This outcome clearly does not seem to have been achieved, although the passage of Title IX in 1972 improved opportunities for females to participate in school-related physical activities and led to a threefold increase in the number of females participating in interscholastic sports (Coakley, 1994). The sharp decline in female physical activity in general throughout the period of adolescence remains and is more pronounced than in their male counterparts (Lowry et al., 2001). What is not clear from the results of the studies we have reviewed is the cause of this decline in female participation. A richer understanding of the factors that explain the significant decrease in vigorous activity exhibited by high school girls may require more evidence of the types of physical activities this population participate in and insight into gender differences in correlates of physical activity.

One finding that seems to consistently emerge from the youth physical activity studies is the gender difference in variables that are most highly correlated with physical activity. For girls, the most commonly occurring correlates of physical activity behavior were self-confidence related to athletic or sport skills (Butcher, 1983; Ferguson et al., 1989; Sallis et al., 1999; Zakarian et al., 1994) and attitudes toward physical education (Ferguson et al., 1989; Sallis et al., 1999; Trost et al., 1997; Zakarian et al., 1994). For boys, again self-efficacy was a powerful determinant of physical activity (Ferguson et al., 1989; Sallis et al., 1999; Trost et al., 1997; Zakarian et al., 1994), but attitude to physical education was only shown to be a significant predictor of physical activity in one study (Sallis et al., 1999). The gender difference in the role of attitudes toward physical education in explaining the variance in youth physical activity has implications for the physical education community. For many girls, it seems a positive (or negative) experience of physical education has a pronounced effect on their willingness to be involved in physical activity. Considering the significant decrease in physical activity in female adolescents, physical educators must pay greater attention to the needs of this population of students and consider modifying existing school physical education programs to accommodate the physical activity interests of girls. Williams, Bedward, and Woodhouse (2000), for example, reported that secondary-aged girls favor lifetime activities, such as individual games and swimming and dance, over other team game-related activities.

From the Sallis et al. (2000) review, the most powerful psychological correlates of female youth physical activity seem to be perceived competence and attitude to physical education. Motivational climate research in physical education (Papaioannou, 1997; Treasure, 1997) has shown that both of these variables have the potential to be manipulated by the choice of pedagogy and content a teacher employs within a physical education curriculum. The question thus arises regarding the fidelity of physical education based activity interventions in targeting these important correlates of youth physical activity for both females and males.

Review of Large-Scale Physical Education-Based Physical Activity Interventions

Recent reviews of the effects of physical activity interventions in youth (Stone, McKenzie, Welk, & Booth, 1998; Ringuet & Trost, 2001) have shown that physical education curricular interventions are often utilized within large-scale school-based programs designed to increase levels of youth physical activity. Over the past decade, 12 large-scale physical activity intervention programs have been completed. These programs included (a) quantitative assessment of physical activity, (b) a comparison or control group (randomized or nonrandomized) design, (c) preschool through high school age participants, (d) U.S. and foreign school or community settings, and (e) were published in English (Stone et al., 1998). Seven of the 12 studies utilized a specific physical activity based physical education curriculum as part of the intervention program. A brief summary of the nature of the physical education intervention and the results of each of these seven studies is presented.

The Go for Health (GFH) program (Simons-Morton, Parcel, Baranowski, Forthofer, & O'Hara, 1991) was a school-based intervention designed to improve

elementary school-aged students' diet and physical activity behavior at school. The GFH intervention used a physical education curriculum (Children's Active Physical Education: CAPE), which consisted of five, 6- to 8-week units, designed to encourage enjoyable moderate to vigorous levels of physical activity (MVPA) among children during physical education (PE) classes (Simons-Morton et al., 1991). In addition, the CAPE program was designed to target an increase in students' knowledge, attitude, and self-efficacy for physical activity. The physical education unit included two or three main cardiovascular fitness activities, such as dancing, running, aerobic games, jump rope, and obstacle courses with each class session consisting of a warm-up, fitness development, cool down, and game activities. The program was effective in increasing the students' level of MVPA within PE lessons and also their knowledge, attitudes, and self-efficacy toward physical activity. The intervention was, however, unsuccessful in its attempts to increase the students' out-of-school physical activity.

The Nebraska School Study (Donnelly et al., 1996), a 2-year intervention, was designed to reduce obesity and improve the fitness levels of rural elementary school children in Nebraska by promoting physical activity within physical education and during lunch recesses. Donnelly et al. (1996) stated that the physical education program included "activities designed to promote energy expenditure and decrease time-off-task using the guidelines of Physical Best, a program of the American Alliance for Health, Physical Education, Recreation, and Dance" (p. 232). The results of the study revealed a 6% increase in student physical activity within PE lessons; however, the students also reported a 15% decrease in out of school physical activity from the beginning to the end of the 2-year intervention.

The CV Health in Children (CHIC; Harrell et al., 1996) was a classroom-based program designed to reduce cardiovascular risk factors in elementary school children. As part of the program, the intervention students received 24 lessons of physical activity based PE lessons that involved students participating in non-competitive aerobic activities such as jump rope to music, "endless relay," and parachute and aerobic dance (Harrell et al., 1996). Utilizing the school as the unit of analysis, the results of the study revealed that the intervention schools had a 23% increase in self-reported physical activity as opposed to the 15% increase found in the comparison schools. At the individual level of analysis, however, this difference between groups on reported physical activity was nonsignificant.

One of the largest and most rigorously monitored and evaluated school-based physical activity promotion intervention for elementary school-aged children has been the Child and Adolescent Trial for CV Health (CATCH; McKenzie et al., 1996). A major component of this 2.5-year program, implemented in 96 public schools in four states, was the health-related physical education curricular program (CATCH PE). The goals of the CATCH PE curricular program were to promote children's enjoyment of and participation in MVPA during PE classes and to provide skills to be used out of school and throughout life that would promote regular participation in physical activity (McKenzie et al., 1994). The content of the CATCH PE curriculum consisted of materials designed for a series of developmentally appropriate activities organized into instructional units, such as aerobic games, aerobic sports, jump rope, and rhythmic activities. Unlike many of the PE curricular programs utilized in previous large-scale intervention studies (Simons-Morton et al., 1991; Donnelly et al., 1996; Harrell et al., 1996), the CATCH PE program also reinforced

an appropriate pedagogy for teachers to adopt while delivering the content. McKenzie et al (1996) stated, "while using appropriate teaching methods, and modeling enthusiasm for an active lifestyle, teachers were to engage students in MVPA during at least 40% of the physical education class period" (p. 424). Results of the 2.5-year intervention included increased student MVPA during physical education lessons and increased out-of-school vigorous physical activity for the intervention group for 3 years following program completion.

The Sports, Play, and Active Recreation for Kids (SPARK; Sallis et al., 1997) involved a 2-year physical education specific intervention that was designed to increase 4th and 5th grade students' physical activity during PE classes and outside school. The SPARK program utilized health-related activities, such as jump rope and aerobic games, and also incorporated sport skill-related movement activities such as soccer and basketball skills within lessons. Students were also taught behavior-change skills using a self-management program designed to help children generalize regular physical activity outside of school. Results of the intervention showed that the program was effective in making students more moderately to vigorously active during PE lessons; however, there was no change in students' out-of-school physical activity.

Although several large-scale projects designed to promote physical activity in secondary school-aged students are in progress (LEAP, Dishman et al., 2004; MSPAN, McKenzie, 2001; TAAG), few interventions that have utilized a comparison group have been completed with this age group. Project Active Teens (Dale, Corbin, & Cuddihy, 1998) is one program that incorporated a theoretically driven physical education curriculum as an intervention strategy to increase the physical activity of a group of high school students. The study examined the physical activity participation of students 1-3 years after they had been exposed to a year-long, 9th grade conceptual physical education program. The Conceptual Physical Education program (CPE) involved using the social cognitive theory of cognitive evaluation (Deci & Ryan, 1985) to teach concepts and facts about physical activity and fitness as well as behavioral skills, such as activity monitoring, goal setting, and program planning. Results indicated an increase in moderate physical activity for males and a reduced rate of inactivity for females within the intervention group.

Summary of Large-Scale, Physical Education Based Physical Activity Promotion Interventions

The results of these large-scale youth physical activity promotion intervention programs reveal few positive findings on measures assessing out-of-school physical activity (Stone et al., 1998). The Nebraska School Study (Donnelly et al., 1996) even reported a decrease in out-of-school physical activity for the intervention group over the 2-year intervention program. Of the studies that utilized a physical education curriculum, CATCH (McKenzie et al., 1994) and Project Active Teens (Dale et al., 1998) were the only interventions that reported significant results in the desired direction. When increasing physical activity within physical education lessons was a target variable of the intervention, physical activity within lessons was usually achieved (Simons-Morton et al., 1991; Donnelly et al., 1996; McKenzie et al., 1994; Sallis et al., 1997) and in CATCH III a significant increase in out-of-school vigorous activity was maintained even after three years without additional CATCH PE intervention with the students (McKenzie et al., 2001).

Healthy People 2010 (USDHHS, 2000) supports the notion that PE classes should be sufficiently active (i.e., 50% of class time; Objective 22-10). This objective has been identified so that youths are better able to meet the recommended daily levels of at least 30-60 minutes of physical activity (Corbin & Pangrazi, 1998; Health Education Authority, 1998; Sallis & Patrick, 1994). With the decline over the past decade in the percentage of students who attend physical education daily (42% to 32%; Lowry et al., 2001), it becomes clear that having increased student physical activity within physical education lessons is insufficient to meet the CDC recommendations for health-promoting levels of physical activity. Unless the trend to decrease required daily physical education is reversed, children must be motivated to participate in frequent sessions of moderate to vigorous activity outside of PE classes in order for the Healthy People 2010 recommendations to be met. The number of large-scale school-based interventions that have been most successful in achieving this goal is limited. The Project Active Teens and CATCH programs are exemplars of interventions that were successful in utilizing a physical education curriculum to promote out-of-school physical activity. Unlike many of the physical education programs utilized as school-based interventions, these two studies adopted a curricular approach, which seemed to be embedded within a particular theoretical pedagogical ethos. The delivery of the content within Project Active Teens (Dale et al., 1998) was situated within Cognitive Evaluation Theory, which proposes that adolescents are more motivated to persist in behaviors if they have a perception of self-determination (Deci & Ryan, 1985).

The goals of the CATCH PE curricular program stipulated a teaching methodology that was designed to “promote student enjoyment of and participation in moderate-to-vigorous physical activity (MVPA) during PE classes and to provide skills to be used out of school and throughout life” (McKenzie et al., 1996, p. 424). Although much of the delivery of the content of CATCH PE was teacher-directed, the pedagogy that emphasized student enjoyment and the provision for education on skills to manage physical activity may have contributed to the increase in out-of-school physical activity that was maintained for a further 3 years post-intervention. The importance of both content and pedagogy in promoting physical activity is supported by Greenwood-Parr and Oslin (1998), who contend that exposure to the range of “lifetime activities” within physical education is only the start of the process of making students lifelong participants in physical activity. Students are more likely to want to continue their involvement in an activity if their PE lessons allow them to experience self-determination and feel competent in their own abilities (Greenwood-Parr & Oslin, 1998). By engaging the students in activities where they had mastery experiences and encouraging students to be active, the CATCH PE program may have been successful in promoting student enjoyment of physical activity. By also providing relevant information on skills to manage out-of-school physical activity, the program gave the students a sense of self-determination toward physical activity behavior. These two affective outcomes are both powerful individual factors in determining motivated behaviors (Ferrer-Caja & Weiss, 2000) and may partly explain the success of the CATCH intervention.

Perceived competence is a powerful psychological correlate of youth physical activity. Studies undertaken to examine specifically the relationship between perceived competence and enjoyment in physical activity generally support theoretical perspectives about the role of perceived competence in influencing enjoyment (Brustad, 1993; Williams & Gill, 1995). The results of a recent study by Carroll

and Loumidis (2001) show that students who perceived themselves as more competent in physical education participated in more physical activity at higher levels of intensity than those who perceived themselves to be less competent. The results of this study also provided evidence that children who had failed to participate in any activity in the previous week perceived their competence in physical education to be significantly lower than those who had participated in the recommended daily amount of physical activity (Carroll & Loumidis, 2001). These findings suggest an association between students' perceived competence in physical education and their out-of-school physical activity.

Recent theories of motivation (Ames, 1992) applied to physical activity (Duda, Chi, Newton, Walling, & Catley, 1995) and physical education settings (Treasure & Roberts, 2001) have suggested that students' perception of competence within a physical activity is shaped by their motivational orientations and the class climate created by the teacher. Achievement goal theory (Nicholls, 1989) states that individuals will have a tendency to be either task-oriented and focus on mastering the activity through active engagement and high effort or ego-oriented and participate in the activity in order to demonstrate normative superiority. Recent research (Treasure & Roberts, 2001) has shown that the type of goal orientation adopted by a student may be affected by the pedagogy or the type of instruction delivered by the teacher. A pedagogy that fosters student choice in tasks promotes cooperative group structures, recognizes individual improvement through private recognition, and adjusts time allocated for tasks dependent on student learning will foster a more task-involved climate and bring about more positive affective student responses (Ames, 1992). The notion of allowing students "time to learn" (Bloom, 1985, p. 185) has also been delineated as a key instructional variable in promoting mastery learning experiences within educational research.

Research has also shown that the effect of teacher feedback on students' perception of competence within physical education lessons varies dependent on the age (Weiss, Ebbeck, & Horn, 1997) and gender (Biddle & Armstrong, 1992) of the students. Biddle and Armstrong (1992) found that a sample of 11-12-year-old boys appeared to be less dependent on the teacher, less interested in pleasing the teacher and obtaining good marks, but interested in the challenge of the activity for its own sake. In contrast, active girls showed a tendency toward extrinsic autonomous judgment whereby they were dependent on the teacher's opinion or judgment about what to do and how well they had performed in PE (Biddle & Armstrong, 1992). This latter finding may begin to explain the gender difference on the correlation between the variables "attitudes to physical education" and "youth physical activity" (Sallis et al., 2000).

Summary and Recommendations

The promotion of youth physical activity is a complex task. Despite its complexity, the public health benefits of having a physically active youth population outweigh the difficulties associated with designing and implementing a multifactor intervention. Numerous descriptive and correlational studies show that physical activity levels decline as children age (Sallis et al., 2000), and the decline is so great within adolescence that this age group has been referred to as a risk factor for physical inactivity (Rowland, 1999).

Sallis and McKenzie (1991) have suggested that physical education may be a key factor in the promotion of youth physical activity. The results of the Sallis et al. (2000) review reveal that attitude toward physical education was indeterminate in its association with levels of youth physical activity. The authors suggest that the lack of consistency in the findings could, however, be due to differences in measurement or population sample or confounding or moderating variables that need to be accounted for within the analyses. A review of the specific studies that utilized an assessment of attitude toward physical education revealed that the measurement of this variable was indeed problematic within many of the studies.

Sallis et al.'s (2000) review did illustrate that during adolescence, psychological variables such as achievement orientation, perceived competence in an activity, and intention to be active are very important variables in determining level of physical activity. Research conducted within physical education over the last decade (Ntoumanis & Biddle, 1999) has demonstrated the potential role that physical educators can play in determining students' achievement orientation and facilitating an increased perception of competence and enjoyment within an activity area (Treasure & Roberts, 2001). Research (Carroll & Loumidis, 2001) has also shown that students who perceived themselves as more competent in physical education participate in more out-of-school physical activity at higher levels of intensity than those who perceived themselves to be less competent. This evidence suggests that teaching strategies utilized in physical education, such as those associated with a task-oriented climate, influence the psychological mediators of youth physical activity, such as perceived competence, enjoyment, and intention to be active. From the review of the large-scale physical activity interventions, which utilized physical education curricular programs, the effectiveness of physical education within this process seems to be dependent, not only on the content, but also the pedagogy embedded within the curriculum. The interventions that were successful in increasing students' out-of-school physical activity were either embedded within pedagogical motivational theoretical frames (Project Active Teens; Dale et al., 1998) or emphasized a pedagogy that fostered student enjoyment as a critical factor within the design of the curriculum (CATCH; McKenzie et al., 1997).

Although physical education is still mandated in nearly all 50 states of the United States (NASPE, 2002), secondary school level participation in PE is declining, both in terms of overall enrollment and the number of classes students have per week (Lowry et al., 2001). This reduction in curriculum time limits physical education's potential to influence youth physical activity. For example, even if students are physically active for 100% of physical education lesson time, it is still insufficient to meet the demands of the CDC recommendations for health-promoting levels of physical activity. If physical education is to play an important role in the promotion of youth physical activity, exposing students to a range of fitness, sport, and recreational physical activities is only the start of the process. Students are only likely to want to continue their involvement in an activity if their physical education lessons allow them to experience self-determination and feel competent in their own abilities (Greenwood-Parr & Oslin, 1998). This self-determination may be achieved by implementing a content that teaches students effective activity self-management skills (McKenzie et al., 1997); however, theories of motivation suggest that the success of curricular programs is also dependent on the methodology employed by the teacher. Content may give our youths the physical and behavioral skills;

however, without an appropriate pedagogy that fosters enjoyment, the motivation to continue to participate may be lost.

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