Canadian Journal of Educational Administration and Policy, Issue #143, August 3, 2013.

SCHOOL CULTURE AND PHYSICAL ACTIVITY:

A SYSTEMATIC REVIEW

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This review examines literature on aspects of school culture and students' physical activity participation. The following questions were addressed: (1) what aspects of school culture have been examined in relation to physical activity, (2) what is the weight of evidence concerning the relationships between school culture factors and physical activity participation, and (3) what are the areas of need in this line of research. Edgar Schein's organizational culture model offered the framework for analysis in which pertinent articles were categorized into one of three levels of school culture: (1) artifacts, (2) espoused values, and (3) underlying member assumptions. School artifacts associated with physical activity were used more frequently by students and staff when these spaces and equipment were maintained, relevant to the school context and when daily practices allowed access to these artifacts during leisure times. A secondary theme revealed the importance of school-based, adult and student role models; when both were plentiful in schools, students and staff were more active at school on a daily basis. Another key finding indicated that students in Physical Education (PE) classes that reinforced traditional, team games (i.e., basketball, volleyball) were less active than students in PE classes that incorporated culturally relevant, lifestyle, and small-sided games.

School Culture and Physical Activity: A Systematic Review

Many children are not meeting public health guidelines recommending at least 60 minutes of moderate-to-vigorous daily physical activity (Active Healthy Kids Canada, 2010; Janssen et al., 2005). A key strategy employed to address physical inactivity among children and youth has been to focus on the school context since this is where children spend a majority of their time (Fox, Cooper, & McKenna, 2004; Pate et al., 2005) and because this approach reaches

the vast majority of children and youth, including high risk groups (Dobbins, DeCorby, Robeson, Husson, & Tirillis, 2009). Evidence suggests that effective school cultures produce positive academic and behavioral outcomes for schools and their members (Deal & Kennedy, 1983; DeWit, McKee, Fjeld, & Karioja, 2003; DeWit et al., 2000). Thus, it is plausible that school cultures can impact student physical activity levels as well. This paper brings together literature that examines both physical activity of children and youth and aspects of school culture.

Typically, schools present opportunities for physical activity through (1) physical and outdoor education classes; (2) access to playing fields, gymnasiums, and playgrounds during leisure times; (3) connections with community recreation facilities and programs; (4) intramural activities; and (5) interscholastic sports. Evidence suggests that students who are able to engage in these opportunities are more active (Belanger et al., 2009; Cooper, Page, Foster, & Qahwaji, 2003; Dale & Corbin, 2000; Gavarry et al., 1998; Mallam, Metcalf, Kirkby, Voss, & Wilkin, 2003). However, not all schools offer these types of opportunities. Physical activity has been restricted in some schools because of budgetary constraints, school policies that limit the time dedicated to physical education (Datar & Sturm, 2004), and limited physical activity equipment and minutes dedicated to leisure times (i.e. recess and lunch periods) (Koplan, Liverman, & Kraak, 2005; Rosenfeld, 2004; Trudeau & Shephard, 2005).

Student participation in school-based physical activity is important for health, psychosocial, and academic reasons. From a physical health perspective, a recent review that focused on studies examining the relationship between physical activity and health found that the more active school-aged children and youth are, the greater the associated health benefits (Janssen & LeBlanc, 2010). For example, regular participation in moderate-to-vigorous physical activity is associated with: enhanced bone health in later life (Janssen & LeBlanc, 2010;

Slemenda, Miller, Hui, Reister, & Johnston, 1991; Valimaki, Karkkainen, & Lamberg-Allardt, 1994), a reduced likelihood of developing type 2 diabetes and hypertension (Ekelund et al., 2009; Janssen, 2008), and increased muscular strength and flexibility (Strong et al., 2005). As well, engaging in moderate to vigorous physical activity has been correlated with reduced epinephrine levels, lower resting heart rates, lower blood pressure, lower cholesterol levels, and decreased cardiovascular response to stressful situations (Holmes, Eisenmann, Ekkekakis, & Gentile, 2008; Nabkasorn et al., 2006).

Students also obtain psychosocial benefits through participation in physical activity including improved mental health (Barr-Anderson et al., 2007); more positive feelings towards school (Broh, 2002; Gilman, Meyers, & Perez, 2004; Marsh, 1993) and school staff (Fletcher, Nickerson, & Wright, 2003); improved social skills (Ewing, Seefeldt, & Brown, 1996; Jeziroski, 1994; Poinsett, 1996); and increased cooperation and collaboration with their peers (Dyment & Bell, 2007). Children and adolescents who are physically active on a daily basis report fewer incidences of anxiety and depressive states (Biddle, Sallis, & Cavill, 1998; Calfas & Taylor, 1994; Datar & Sturm, 2006; Hausenblas & Symons-Downs, 2001; Kantomaa, Tammelin, Ebeling, & Tannila, 2008; Mustillo et al., 2003; Zoeller, 2007); express higher self-esteem (Tremblay, Inman, & Willms, 2000; Wang & Veugelers, 2008; Zoeller, 2007) and improved self-efficacy (Bonhauser et al., 2005); and demonstrate enhanced intra- and inter-personal skills (Allison & Adlaf, 2000; Calfas & Taylor, 1994). Participation in physical activity also helps students feel part of their school, and feeling connected is associated with mental and physical health and increased engagement with the school environment (Gilman et al., 2004; Juvonen, 2006; Resnick et al., 1997). School connectedness can be defined as one's sense of belonging to a school, school involvement, or school attachment (Blum, 2005; Libbey, 2004). In essence, it is

a psychological need that is satisfied through positive relations with teachers, peers, and engagement in school activities (Osterman, 2000; Thompson, Iachan, Overpeck, Ross, & Gross, 2006). Students who are positively connected to their school have high self-esteem (McHale et al., 2005), participate in extracurricular programs (McNeely, Nonnemaker, & Blum, 2002), and have a better understanding of how they fit into their school's social fabric (Bonny, Britto, Klostermann, Hornung, & Slap, 2000; Gilman et al., 2004).

Academically, children who are active during the school day tend to be more eager to learn (Strong et al., 2005); have better information retention (Field, Diego, & Sanders, 2001); have longer attention spans (Sibley & Etnier, 2003); and exhibit positive classroom behaviour (Mahar et al., 2006). They have also been shown to achieve higher grade point averages (Ahamed et al., 2006) and score significantly higher on tests related to language arts and reading (Castelli, Hillman, Buck, & Erwin, 2007; Datar & Sturm, 2006; Lidner, 2002; Stevens, To, Stevenson, & Lochbaum, 2008; Tremarche, Robinson, & Graham, 2007).

The preceding paragraphs demonstrate that participation in school-based physical activity can contribute to a student's overall health and academic success. However, not all schools offer multiple physical activity opportunities for reasons outlined earlier, while some schools find ways to maximize physical activity opportunities despite the barriers in the external environment. Evidence suggests that students in schools that support physical activity are more active throughout the school day (Barr-Anderson et al., 2007; Pate et al., 2005). Moreover, aspects of school culture have been explored in the literature as potential correlates to school-based physical activity. In general, the research in this area has focused on the individual components of a school's cultural system rather than the broader construct of culture.

Effective School Culture

School culture became a major theme in organizational literature in the early 1980's and has gained widespread acceptance as being an important part of effective schools (Deal, 1985; Deal & Kennedy, 1983). Numerous school culture studies have uncovered similarities between the cultural dimensions in high performing organizations and high achieving schools (Bolman & Deal, 1992; Deal, 1985; Deal & Kennedy, 1983; Deal & Peterson, 1990; Finn, 1989; Fullan & Hargreaves, 1996; Furtwengler & Micich, 1991; Fyans & Maehr, 1990; Hargreaves, 1994; Hargreaves & Fullan, 1998; Holland & Andre, 1987; Jones, 1991; Kelly & Bredeson, 1989; Kottkamp, 1984; Newmann & Wehlage, 1995; Saphier & King, 1985; Stoll, 1998). These studies found that effective cultures were continually evolving to meet on-going internal and external demands. Conversely, less effective cultures did not adapt (or adapted poorly) to the changing environment and held on to values and policies that no longer related to the issues facing employees or school members (Schein, 1990).

However, no single type of culture produces the desired effects for every school member in every school context. For the milieu of this paper, an "effective school culture" is one that maximizes opportunities for school-based physical activities.

Theoretical Framework

Organizational culture research has led to an array of theoretical frameworks that attempt to characterize culture. In the mid-1940's, culture was viewed as a system of objects, non-purposeful actions, and attitudes; ultimately, a means to an end (Malinowski, 1944). As research evolved in this area, member actions were found to originate from an organization's values (Parsons, 1951) and its past and present leaders (Schneider, 1975).

Many organizational culture researchers have based their research on Edgar Schein's cultural systems theory (Barnett, O'Loughlin, Gauvin, Paradis, & Hanley, 2006; Barth, 2002; Cavanagh & Waugh, 2004; Cullen, Baranowski, & Baranowski, 1999; DeWit et al., 2000; Gaziel, 1997; Maes & Lievens, 2003; Maslowski, 2001; Schein, 1999; Schein, 1985; van der Westhuizen, Mosoge, Swanepoel, & Coetsee, 2005; van der Westhuizen, Oosthuizen, & Wolhuter, 2008) which is grounded in earlier theories of group behavior, social systems, and organizational functional analysis (Homans, 1950; Merton, 1968; Parsons, 1951). Schein (1985a) discovered that as an organization evolved and became more resilient, its culture became embedded into members' sub-conscious; in effect, the way things were to be done. In turn, once a cultural system was established, it became more visible to outsiders, newcomers conformed without debate, and member behaviors dictated how the environment was perceived. In 1999, Schein refined his theory to include the understanding that behaviors within an organization could only be interpreted in the specific context in which the cultural system existed (Schein, 1999).

Though many approaches contribute to our overall understanding of culture in organizations, Schein's theory takes a systems approach and offers a holistic definition of culture that encapsulates the internal and external components of an organization. In doing so, Schein's theory accounts for the elements of climate, environment, and the broader concept of culture. Specifically, Schein (1985) posits that an organization's cultural system exists at three distinct levels, some more visible than others, that affect member behaviors. The innermost and least tangible level of a school's cultural system is its underlying member assumptions or taken for granted beliefs that provide the structure for school values and behaviors. The next level contains the more visible elements of a school's cultural system such as espoused values and practices

established in school strategies, goals, and philosophies. The outermost level of a school's cultural system is its artifacts; this includes any tangible components of a school such as the physical layout, how people dress, smells in the hallways, and even visuals hanging on school walls (i.e., posters, trophy cases) (Schein, 1990). To an outsider, these artifacts may be difficult to decipher, but they are external representations of school members' beliefs and values.

Schein's three levels of culture serve as an organizational framework for this paper that examines the relationship between school culture and physical activity. This cultural model is particularly appropriate because it provides distinct lenses into the less tangible components of school culture facilitating a deeper analysis of the factors associated with school-based physical activity. Specifically, this review investigates (1) the aspects of school culture that have been examined in relation to physical activity, (2) the weight of evidence of relationships between specific cultural factors and physical activity participation, and (3) the areas of need in this line of research.

Methods

Data Sources

Key word searches identified articles from the entire contents of the following databases from 1999–2009: Academic Search Complete, PsycArticles, CINAHL, Health Source: Nursing/Academic Edition, MEDLINE, ERIC, Web of Science, and SportDiscus. The key words used to identify articles on the population of interest were "children," "youth," "adolescents," "elementary school," "middle school," "primary school," "secondary school," and "high school." A broad interpretation of the concept of culture was used to be as comprehensive as possible in the search. In turn, each of the population search terms were combined with "school culture,"

"school climate," "school environment," "comprehensive school health," "school achievement," "school policy," "physical activity," "sport," "physical education," "extra-curricular," "intermural," "intramural," and "fitness" to identify articles on the topic of interest for this review. This produced a total of 3061 citations. When English-language and peer-reviewed articles were added to the search as limiters, 1047 articles were removed leaving a total of 2014 articles for further analysis. Examination of the reference lists of the retrieved articles identified 20 additional articles. In total, 2034 citations were reviewed.

Inclusion and Exclusion Criteria

English-language and peer-reviewed articles that investigated physical activity levels of school-aged children and adolescents in relation to school culture were included in this review. Single classroom interventions and studies where external sources (e.g., researchers) delivered intervention programs were not included. However, interventions implemented through school staff were included. In total, 2034 citations were examined which led to the exclusion of 1936 citations for the following reasons: 438 citations were duplicated within the databases searched, 71 were not empirical studies, 1195 were unrelated to topic of interest, 64 studies involved children with special needs, 123 citations did not empirically measure school culture, school climate, or school environment, two articles were excluded because they were single class interventions, and 43 studies did not quantitatively or qualitatively measure physical activity. Consequently, 98 articles fulfilled the primary selection criteria and were included in this review.

Data Extraction

Once a study was deemed eligible for inclusion, the following data was extracted: study author(s), characteristics of participants (age, sex), school context (elementary, middle, and secondary), study design, data sources, outcome measures (what was measured, how was it measured [including validity], when it was measured), and study findings. For intervention studies, aims were briefly addressed. Qualitative findings were synthesized into broad thematic categories and descriptive and inferential statistics were extracted from the quantitative studies to examine relationships between physical activity and school culture.

Data Synthesis

Studies were initially separated into three cultural levels: artifacts, espoused values, and underlying member assumptions; distinctions grounded in Schein's (1985) theory of organizational culture. Studies that examined visible school structures and processes (i.e., physical environment, school type, school space) were considered artifacts; studies that investigated school policies and practices were deemed espoused values; and studies that examined school member beliefs, assumptions, or feelings were categorized as underlying member assumptions. In addition, studies were further separated by study design: descriptive and experimental.

To deal with the multitude of approaches used to quantify relationships between factors and physical activity (e.g., odds ratios, correlation coefficients), descriptive studies were coded using a system previously used by Trost and colleagues (Trost, Owen, Bauman, Sallis, & Brown, 2002). Positive "+", negative "-", and no association or mixed findings "0" were indicated. For factors that were consistently (≥ 4 studies) positively or negatively associated with physical

activity, "++" or "- -" were used respectively. Additionally, key thematic associations between school culture and school-based physical activity deduced from the reviewed findings will indicate areas for future research.

Results

General Study Characteristics

A summary of study characteristics organized according to Schein's (1985) levels of school culture is presented in Appendix A. This table illustrates that there were twice as many studies involving aspects of school culture from 2005 to 2009 compared with 1999 to 2004. A majority of study participants were female: 95% were students, and the remaining 5% consisted of teachers, parents, community practitioners (i.e., school nurses), or administrators. Most studies with student participants were quantitative and employed direct researcher observation, questionnaire, or objective methodologies as measures of physical activity. In addition, 74% of all recruited participants were from North America or the United Kingdom/Europe.

The reviewed studies focused primarily on underlying member assumptions (n = 41) and artifacts (n = 37). Studies examining espoused values received less attention in the literature (n = 20) and focused primarily on secondary school physical activity policies and practices that impact physical activity levels. Elementary schools were the most common research context with elementary school members being recruited for 70% of the intervention studies reviewed. The approaches used to measure factors varied widely; however, physical activity was predominantly measured using questionnaires. Approximately 40% of studies measured physical activity using direct measures (pedometers, heart rate monitors, accelerometers, and observation).

Descriptive Quantitative Studies

Descriptive studies that measured physical activity relative to a school's cultural system are presented in Appendix B. The review identified 24 factors studied in association with school-based physical activity: 11 at the artifacts level, 6 at the level of espoused values, and 7 associated with underlying member assumptions. The factor that emerged as being positively and consistently associated with physical activity at the artifacts level was the availability of physical activity facilities (Barnett et al., 2006; Cohen, Scott, Zhen Wang, McKenzie, & Porter, 2008; Haug, Torsheim, Sallis, & Samdal, 2008; Haug, Torsheim, & Samdal, 2008; Nichol, Pickett, & Janssen, 2009; Ommundsen, Klasson-Heggebo, & Anderssen, 2006; Williden et al., 2006). In addition, modest positive associations with physical activity were found with availability of physical activity equipment (Haug, Torsheim, Sallis, et al., 2008; Haug, Torsheim, & Samdal, 2008; Zask, van Beurden, Barnett, Brooks, & Dietrich, 2001); condition of physical activity facilities (Nichol et al., 2009); storage space available for physical activity equipment (Barnett et al., 2006); and just by being present at school (Barr-Anderson et al., 2007; Fairclough, Butcher, & Stratton, 2008; Fein, Plotnikoff, Wild, & Spence, 2004; Henry, Webster-Gandy, & Elia, 1999). In terms of the space within school boundaries, indoor building square footage (Cradock, Melly, Allen, Morris, & Gortmaker, 2007) and the quality and size of grounds surrounding school buildings (Haug, Torsheim, Sallis, et al., 2008; Haug, Torsheim, & Samdal, 2008) were also positively associated with physical activity.

At the espoused values level of school culture, school-based physical activity opportunities (Durant et al., 2009; Harrison & Narayan, 2003; Li, Dibley, Sibbritt, & Yan, 2006; McKenzie, Marshall, Sallis, & Conway, 2000b; Nichol et al., 2009; O'Malley, Johnston, Delva, & Terry-McElrath, 2009) were positively and consistently associated with physical activity.

Policies and practices related to these opportunities also demonstrated modest and positive associations with physical activity (Barnett et al., 2006; Cohen et al., 2006; Durant et al., 2009; Eyler et al., 2008; Fein et al., 2004; Haug, Torsheim, & Samdal, 2008; Nichol et al., 2009; Ommundsen et al., 2006; Wen et al., 2008). Furthermore, the descriptive studies that investigated underlying member assumptions found physical activity to be positively associated with teacher (Lei, Phillips, Allen, & Julian, 2004; Ommundsen et al., 2006) and principal (Barnett et al., 2006; Faulkner, Adlaf, Irving, Allison, & Dwyer, 2009) involvement in school-based physical activity. Also at this level of analysis, student values related to physical activity (Zhang, Middlestadt, & Ji, 2007) and their feelings of connectedness to their school (Faulkner et al., 2009) were positively associated with physical activity levels.

Contrastingly, there were factors linked with school culture found to generate mixed or null associations with physical activity. For example, student relationships with their physical education teacher did not influence a secondary student's decision to be more active at school. A potential reason for this finding could be due to the school context in which the study took place. Elementary students in particular spend the majority of the school day with a singular teacher; it is plausible that this teacher would have a significant influence on their students' daily physical activity levels. Furthermore, in the study that found this weak association, the respondents were primarily female suggesting that student-teacher relationships may have limited influence on a females' physical activity behaviour in secondary school settings. Another cultural factor that produced mixed associations with physical activity was a school's physical education practices. The four studies that examined the association between physical education practices and student physical activity levels were diverse in many ways. Firstly, two of the studies were undertaken in the United States, one was in Vietnam, and other in China. Secondly, students responded to a

self-report survey in three of the four studies and administrators were the main respondents in the other study. Thus, due to cultural differences between participants, and the general understanding that students and administrators have varying perceptions on how physical education practices influence daily physical activity levels, it is not surprising the findings overall were mixed in this area of study. A final factor that showed mixed associations with physical activity was the available space for physical activity on school grounds. A rationale for this finding lies in the methodology of the studies that examined this association. In the studies that asked students to wear accelerometers for a specified amount of time at school (Cohen et al., 2008; Cradock et al., 2007), a direct positive association between school campus area (indoor and outdoor) and student physical activity levels was found. On the other hand, in studies that used self-report questionnaires completed by school staff (i.e., teachers and administrators), no association was found between these two variables.

Quantitative Intervention Studies

Studies that intervened in school culture to impact physical activity are reported in Appendix C. From these studies, 12 factors were found to influence physical activity levels at school: 2 at the artifacts level, 5 at the level of espoused values, and 5 associated with underlying member assumptions. At the artifacts levels, playground markings (Fitzgerald, Bunde-Birouste, & Webster, 2009; Loucaides, Jago, & Charalambous, 2009; Ridgers, Stratton, Fairclough, & Twisk, 2007; Stratton, 2000; Stratton & Leonard, 2002) and the provision of sport and games equipment during leisure times (Haerens et al., 2006; Loucaides et al., 2009; Ridgers et al., 2007; Stratton, 2000; Stratton & Leonard, 2002; Verstraete, Cardon, De Clercq, & DeBourdeaudhuij, 2006) consistently and positively influenced student physical activity levels. At the espoused

level of analysis, student physical activity levels were positively influenced in schools that promoted physical activity through links with resources in the community (Manios, Moschandreas, Hatzis, & Kafatos, 1999; Webber et al., 2008) and offered multiple physical activity opportunities (Eyler et al., 2008; Jurg, Kremers, Candel, Van der Wal, & Meij, 2006; Kong et al., 2009; Pate et al., 2005; Sallis et al., 2003; Thompson et al., 2001; Webber et al., 2008). Student physical activity levels increased in schools that included lifestyle activities and small-sided games into physical education classes (Pate et al., 2005); however, physical activity levels were not affected by credit offerings for physical activity participation outside of physical education (Webber et al., 2008). At the underlying member assumptions level, teacher (Dzewaltowski et al., 2009; Ernst & Pangrazi, 1999; Loucaides et al., 2009; Mahar et al., 2006; Pangrazi, Beighle, Vehige, & Vack, 2003; Pate et al., 2005; Scruggs, Beveridge, & Watson, 2003; Stewart, Dennison, Kohl, & Doyle, 2004; Verstraete et al., 2006) and student directed (Fitzgerald et al., 2009) physical activity sessions, and school-based physical activity workshops for primarily elementary parents, teachers, and students (Manios et al., 1999; Wen et al., 2008) were other factors positively associated with physical activity. The mutual participation of middle school parents and children in school-based physical activity (Jurg et al., 2006), and cultural-specific physical education activities (Going et al., 2003; Pate et al., 2005; Wilson et al., 2005) also contributed modestly to increased student physical activity levels.

Qualitative Studies

Appendix D summarizes themes from studies using qualitative methodologies. At the artifacts level, lack of physical activity facilities on school grounds (Crawford et al., 2008; Fitzgerald et al., 2009; Mulvihill, Rivers, & Aggleton, 2000; Naylor, Macdonald, Zebedee, Reed,

& McKay, 2006; Thompson, Rehman, & Humbert, 2005; Williden et al., 2006; Young et al., 2007); the condition of facilities (Fitzgerald et al., 2009; Mulvihill et al., 2000); and insufficient school spaces for physical activity (Allison & Adlaf, 2000; Bauer, Patel, Prokop, & Austin, 2006; Bauer, Yang, & Austin, 2004; Crawford et al., 2008; Dagkas & Stathi, 2007; Dyment & Bell, 2007; Fitzgerald et al., 2009; Gyurcsik, Spink, Bray, Chad, & Kwan, 2006; Hohepa, Schofield, & Kolt, 2006; Lounsbery, Bungum, & Smith, 2007; Mulvihill et al., 2000; Thompson et al., 2005) were considered by students, parents, and school staff to be negatively associated with student physical activity levels. In terms of espoused values, school policies and practices linked to physical activity (Ahlport, Linnan, Vaughn, Evenson, & Ward, 2008; Boyle, Jones, & Walters, 2008; Dyment & Bell, 2007; Eyler et al., 2008; Fitzgerald et al., 2009; Jennings-Aburto et al., 2009; Lounsbery et al., 2007; MacQuarrie, Murnaghan, & MacLellan, 2008; Monge-Rojas, Gartia-Arce, Sanchez-Lopez, & Colon-Ramos, 2009; Mulvihill et al., 2000; Naylor et al., 2006; Parks, Solmon, & Lee, 2007; Salmon, Salmon, Crawford, Hume, & Timperio, 2007; Schetzina et al., 2009; Williden et al., 2006; Young et al., 2007; Zhang et al., 2007), including active transportation policies (Eyler et al., 2008; Jennings-Aburto et al., 2009; Mulvihill et al., 2000; Young et al., 2007) and times dedicated to leisure (Crawford et al., 2008; Hohepa et al., 2006; Monge-Rojas et al., 2009; Thompson et al., 2005), were perceived to be key factors associated with physical activity. Finally, qualitative studies that examined underlying member assumptions suggested that elementary and middle school teacher role models who value physical activity (Barnett et al., 2006; Boyle et al., 2008; Dyment & Bell, 2007; Faulkner et al., 2009; Jennings-Aburto et al., 2009; Lounsbery et al., 2007; MacQuarrie et al., 2008; Monge-Rojas et al., 2009; Naylor et al., 2006; Ommundsen et al., 2006; Schetzina et al., 2009; Thompson et al., 2005), teacher-coaches (Bauer et al., 2004; Lounsbery et al., 2007; Thompson et al., 2005), activities

offered in physical education (Eyler et al., 2008; Hohepa et al., 2006; Schetzina et al., 2009), and relationships between teachers and students (Boyle et al., 2008; Lounsbery et al., 2007) were also important school culture variables associated with a student's decision to participate in school-based physical activity.

Discussion

In this paper, Schein's (1985) cultural framework provides operative boundaries that encapsulate the many aspects of a school's cultural system; it allows for a more complex analysis of the tangible and intangible factors in a school culture that are associated with school-based physical activity. The following paragraphs address the relationships and interactions of these factors across school cultural levels and research methodologies. Key themes drawn from the reviewed literature refer to the more frequently explored factors relative to physical activity; sub-themes pertain to the less explored factors.

The first key theme represents the importance of a school's ability to offer physical activity opportunities. Within the artifacts and espoused values levels of school culture, several intervention studies added playground markings to outdoor paved surfaces (Fitzgerald et al., 2009; Mulvihill et al., 2000; Ridgers et al., 2007; Stratton, 2000; Stratton & Leonard, 2002), and implemented researcher-guided, teacher-led classroom physical activities and modified physical education sessions (Haerens et al., 2006; Jurg et al., 2006; Loucaides et al., 2009; Mahar et al., 2006; Verstraete et al., 2006; Webber et al., 2008), resulting in enhanced elementary and middle school students' daily physical activity levels. However, reasons why these interventions enhanced physical activity are not clear, as teacher and student perceptions concerning these changes were not obtained. Also, there is no evidence that playground markings and teacher-led

physical activity opportunities sustain student physical activity levels achieved during intervention beyond a 12-week period. At the underlying member assumptions level of school culture, mostly middle school staff, parents, and students revealed that supportive physical activity policies and practices were perceived to be associated with school-based physical activity opportunities (Dyment & Bell, 2007; Fitzgerald et al., 2009; Monge-Rojas et al., 2009; Williden et al., 2006; Young et al., 2007). Other studies also found associations between elementary teachers, parents, and students' involvement in the development and maintenance of school-based physical activity opportunities and increased student physical activity levels (Allison & Adlaf, 2000; Hohepa et al., 2006; Manios et al., 1999; Wen et al., 2008). From this evidence, it seems that the positive influence of artifacts (i.e., playground markings) on student physical activity is accentuated through school practices that allow access to these artifacts.

Contained within the overall theme of physical activity opportunities are the following three sub-themes: (1) availability of, and storage space for, physical activity equipment; (2) physical space available on school grounds for physical activity; and (3) the number, quality, and accessibility of school-based physical activity facilities. At the artifacts level of analysis, many studies indicated that the availability of physical activity equipment (Haug, Torsheim, Sallis, et al., 2008; Haug, Torsheim, & Samdal, 2008; Zask et al., 2001) and storage space (Barnett et al., 2006) for this equipment (i.e. bicycles, scooters) were associated with enhanced student physical activity across school contexts (Bauer et al., 2004; Crawford et al., 2008; Gyurcsik et al., 2006; Haerens et al., 2006; Haug, Torsheim, Sallis, et al., 2008; Haug, Torsheim, & Samdal, 2008; Ridgers et al., 2007; Thompson et al., 2005; Verstraete et al., 2006; Zask et al., 2001). At the espoused values level of school culture, middle school students said if they had access to exercise equipment during school leisure times, they would use it (Bauer et al., 2004).

Researchers also discovered that when teachers activated games along with physical activity equipment (Dzewaltowski et al., 2009; Haug, Torsheim, & Samdal, 2008; Loucaides et al., 2009; Mahar et al., 2006; Pangrazi et al., 2003; Scruggs et al., 2003; Stewart et al., 2004; Verstraete et al., 2006), student physical activity levels were positively and significantly influenced. Thus, any school that provides student access to physical activity equipment, and encourages teachers to facilitate physical activity associated with the equipment, are successfully influencing a student's decision to use the equipment in a physically productive way.

The second sub-theme identifies the importance of physical spaces (indoor and outdoor) available for physical activity on school grounds. At the artifacts level of school culture, some studies found that a middle school's indoor and outdoor spaces were significantly associated with daily student physical activity (Cohen et al., 2008; Cradock et al., 2007). At the underlying member assumptions level of school culture, elementary students stated that well maintained play structures and large outdoor play areas were important for engagement in physical activity; on the other hand, secondary students believed that activity specific areas such as skate-parks, or a piece of cement to skate on, encouraged them to be physically active (Allison & Adlaf, 2000; Bauer et al., 2006; Dyment & Bell, 2007; Fitzgerald et al., 2009; Lounsbery et al., 2007; A. M. Thompson et al., 2005). From these findings, it is apparent that spaces on school grounds have the potential to increase daily student physical activity levels across school contexts. However, these spaces must be maintained, large enough to accommodate student populations, and, in the secondary school context, relevant to student physical activity needs.

The third sub-theme covers the influence of physical activity facilities (including outdoor play structures) on student physical activity levels. From an artifacts perspective, middle school and secondary school students are more active in schools with numerous, high quality

physical activity facilities; however, accessibility (i.e., espoused school values) is important if student usage is to be maximized (Cohen et al., 2008; Durant et al., 2009; Haug, Torsheim, Sallis, et al., 2008; Haug, Torsheim, & Samdal, 2008; Nichol et al., 2009; Ommundsen et al., 2006; Williden et al., 2006). In turn, research pertaining to the underlying member assumptions level of school culture suggests that physical activity facilities are influential on the number and quality of physical activity opportunities. One middle school principal went as far to state that the physical education programs at his school were sub-standard due to the lack of indoor facilities (Young et al., 2007). In comparison, elementary school parents mentioned that their children will not play on school play structures because of the unsafe and visually unappealing nature of the equipment (Fitzgerald et al., 2009; Mulvihill et al., 2000). Overall, this evidence suggests that students are more active in schools that have several well-maintained physical activity facilities.

A second key theme outlines the positive influence that adult and student role models have on student physical activity levels (Barnett et al., 2006; Faulkner et al., 2009; Lei et al., 2004; Ommundsen et al., 2006). Researchers have examined this factor at the espoused values level of school culture and found that: (1) teacher (Loucaides et al., 2009; Mahar et al., 2006; Pangrazi et al., 2003; Pate et al., 2005; Verstraete et al., 2006) and student directed (Wilson et al., 2005) physical activity opportunities (i.e., intramurals, intermurals), and (2) the mutual participation of parent and child in school-based physical activity (Jurg et al., 2006) positively influence middle school students' daily physical activity levels. At the underlying member assumptions level of school culture, fewer studies have also indicated the importance of teachers who value and model physical activity. As one secondary school student said, " I look up to my coaches and physical education teachers—they are my role models" (Thompson et al., 2005, p.

432). In comparison, one middle school teacher stated, "the whole school atmosphere, I think it really does promote kids to be involved in physical activity; for example, we usually do the Terry Fox run with the kids" (MacQuarrie et al., 2008, p. 267). Thus, there is a noticeable gap in the literature concerning the association between adult and student role models and elementary students' physical activity levels.

The third key theme refers to the relationship between physical education practices and student physical activity. This theme was investigated mostly in descriptive and intervention studies at the espoused values level of school culture; only three qualitative studies within the underlying member assumptions level examined physical education practices relative to measured physical activity. In its entirety, the evidence showed mixed associations between the number and length of middle school physical education classes per week and student physical activity (Durant et al., 2009; Li et al., 2006; Nguyen, Trang, Tang, Dibley, & Sibbritt, 2009; O'Malley et al., 2009). This is not surprising as the studies that examined this relationship were conducted in different countries, using a variety of physical activity measures, some of which were not validated for the population of interest. Although the quantity of physical education demonstrated mixed findings, it appears that the content and conduct of physical education is important. For example, lifestyle activities, small-sided games, and culture-specific activities (Going et al., 2003; Pate et al., 2005; Wilson et al., 2005) positively affected middle and secondary students' physical activity levels in physical education. Previous research has shown that students participate more vigorously, and are more motivated, during individual and small group activities in physical education (Gibbons & Humbert, 2008; Kulinna, Martin, Lai, & Kliber, 2003; McKenzie, Marshall, Sallis, & Conway, 2000a). Furthermore, one study found that, when culturally relevant games and activities were introduced into American Indian middle

school physical education, activity levels of boys and girls were higher than students taking regular curricular physical education classes (Going et al., 2003). Therefore, examining physical education practices by recording time or number of lessons may be insufficient to explain the impact of physical education on student physical activity.

Another key theme relates to the importance of active transportation policies. At the espoused values level of school culture, interventions that aimed to promote active transportation through adult walk to school volunteers, classroom promotion of the health advantages associated with walking or biking to school, and by altering school policies to benefit children who used active transportation to and from school all positively influenced daily physical activity levels of elementary and middle school students (Eyler et al., 2008; Haerens et al., 2006; Jurg et al., 2006; Kong et al., 2009). At the underlying member assumptions level, school staff and parents reiterated the importance of supportive school active transportation policies (Jennings-Aburto et al., 2009; Mulvihill et al., 2000; Salmon et al., 2007; Young et al., 2007). One principal affirmed, "by providing crossing guards and walk to school days, children are walking to and from school more" (Eyler et al., 2008, p. 968). School-based promotion of active transportation is vital because children who use active transportation to and from school are generally more physically active (Booth et al., 2007; Cooper, Andersen, Wedderkopp, Page, & Froberg, 2005). It has been argued that by incorporating active transportation into a child or adolescent's occupation as a student, walking or riding a bicycle to and from school may become part of their daily routine and, in turn, help in the sustainability of adequate physical activity levels (Duncan, Duncan, & Schofield, 2008). Recent literature reviews have highlighted the need for studies that investigate children and parents' attitudes towards active transportation (Davison, Werder, & Lawson, 2008; Lorenc, Brunton, Oliver, Oliver, & Oakley, 2008; Panter, Jones, &

Van Sluijs, 2008; Pont, Ziviani, Wadley, Bennett, & Abbott, 2009). In response to this gap in the literature, Pont et al. (2010) have proposed a multi-level model that considers perceptions of children and parents relative to active travel. This model may be useful in gaining a deeper understanding of the facilitators and barriers associated with active travel to and from school.

A less explored theme examined the association between social factors and school-based physical activity. Unlike other themes discussed, this association was investigated solely at the underlying member assumptions level of school culture. First, students across school contexts who feel they are an important part of their school (Faulkner et al., 2009) and perceive their school values physical activity (Fein et al., 2004; Zhang et al., 2007) are more active at school. Secondly, studies that examined the association between student-teacher relationships and physical activity produced mixed associations (Dyment & Bell, 2007; Fein et al., 2004; MacQuarrie et al., 2008). For example, qualitative studies found positive student-teacher relationships to be more abundant in elementary and middle schools that offered several physical activity opportunities relative to schools that presented very few opportunities for students to be physically active during the school day. On the other hand, student-teacher relationships in secondary school settings were not dependent on the number or quality of school-based physical activity opportunities.

Finally, other studies have suggested that student interest and perceived competence in physical activities, negative peer feedback, and stress and anxiety around academic demands may expend more influence on physical activity levels than a school's built environment (Barr-Anderson et al., 2007; Cohen et al., 2008; Groft, Hagen, Miller, Cooper, & Brown, 2005; Haug, Torsheim, & Samdal, 2008; MacQuarrie et al., 2008). From the handful of studies that have

examined school-based physical activity relative to social factors, it is evident these factors are important to consider when attempting to maximize school-based physical activity.

School Context

Although a large majority of the studies reviewed occurred in elementary and middle schools, there were trends that existed across school contexts. As examples, middle school girls (Grades 6–8) were most active in indoor physical activity areas during leisure times (Sallis et al., 2001) and in schools with multiple outdoor physical activity facilities (Cohen et al., 2008). On the other hand, middle school boys were most active in schools that allowed access to outdoor sport courts and physical activity equipment during leisure times (Durant et al., 2009; Sallis et al., 2001). At the high school level (Grades 9–12), students were also most active in schools where physical activity facilities and equipment were accessible and available, but both needed to be in good condition (Fein et al., 2004). Conversely, middle school students believed that having large, teacher-supervised spaces was more important than the condition of the play areas (Haug, Torsheim, Sallis, et al., 2008; Sallis et al., 2001).

On the whole, multiple factors within all levels of school culture influence student physical activity and physical activity opportunities. Thus, using a multi-level approach to examine the impact schools have on physical activity is warranted. In support of this methodology, previous school culture studies have shown that a school's cultural system changes individuals more often than the individuals change the system (Fullan, 1993, 2001, 2005); however, when schools produce enough individuals with collaborative characteristics, they will change the cultural system (Fullan, 2000). Therefore, schools that embrace the direct association between member behaviors and school values and beliefs (Hodgkinson, 1978) will be effective

in sustaining school improvement in any area, because the whole school cultural system (i.e., artifacts, espoused values, underlying member assumptions) is moving forward together (Fullan, 1992, 1998). Furthermore, when school members believe in school policies and practices, transition into school reform is easier, and new initiatives are maintained over time (Deal & Kennedy, 1983; Deal & Peterson, 1999; Fullan, 2001; Hargreaves & Fullan, 1998; Peterson & Deal, 1998).

Limitations

In terms of our review, limitations surrounding the parameters defined for article selection are apparent. For example, specific database searches were limited to English language, peer-reviewed articles between 1999 and 2009. Also, research-led interventions and interventions that involved single school classes were excluded along with studies including special needs students. As a result, relevant studies may have been missed or overlooked due to the established search criteria, choice of databases, or the use of a singular cultural model to characterize review findings.

Limitations were also evident in the reviewed studies. A majority of the studies were cross-sectional, reducing causality to other populations; also, among the intervention studies examined, brief intervention descriptions hampered distribution of findings into artifacts, espoused values, and underlying member assumptions, and, in turn, the analyses. As a result, exacting what intervention component(s) influenced physical activity was challenging and in some studies, could not be isolated. Furthermore, in certain qualitative studies (Bauer et al., 2006; Bauer et al., 2004; MacQuarrie et al., 2008), researchers interviewed students and school

staff during school hours potentially eliminating perspectives of absent participants unable to attend due to scheduling restraints.

Another limitation was the extensive use of self-report measures. Evidence suggests that youth over-report physical activity levels (Ross, Dotson, Gilbert, & Katz, 1985) and, therefore, the accuracy of reported physical activity levels should be cautiously evaluated. As well, self-report measures are not recommended for children younger than 10 years (Kohl, Fulton, & Casperson, 2000; Kohl & Hobbs, 1998); however, some studies used self-report measures with participants under the aforementioned age. Moreover, only 10 of 98 reviewed studies employed mixed methodologies; in these studies, objective measures of physical activity such as pedometers and heart rate monitors enhanced subjective, self-report findings. Thus, future studies examining student physical activity levels relative to a school's cultural system may want to consider integrating methodologies to help increase confidence in study findings.

In addition to the aforementioned limitations, the reviewed literature also posed constraints around school context and gender identification. For example, a majority of studies in this review took place in elementary and middle schools, leaving little evidence connecting physical activity to secondary school cultures. Furthermore, participant's gender was not reported in almost half of the studies examined; this, in turn, compromised gender-specific associations between school culture and physical activity. In the studies that identified gender, participants were primarily female which restricts the understanding of the relationship between school culture and male physical activity levels.

Conclusions

The aims of this review were to examine the relationship between school culture and physical activity, determine the weight of the evidence surrounding this relationship, and to identify future research avenues. This review identified 98 studies from the current literature that explored school-based physical activity in relation to a school's culture. Studies were categorized into Schein's (1985) three levels of organizational culture for analysis: 37 at the artifacts level, 20 at the level of espoused values, and 41 associated with underlying member assumptions. Most of the studies were based in the United States, United Kingdom, and Europe and involved school staff, parents, and students from elementary schools. Translating the findings of the studies reviewed into themes highlighted gaps in the school culture and physical activity literature that require additional study. Recommendations for future research are discussed according to Schein's (1985) three levels of organizational culture.

While physical manifestations of opportunities for physical activity such as the number, quality, and size of school facilities are associated with enhanced physical activity, no studies have examined school member perceptions concerning this relationship. As outlined in Schein's model of organizational culture (Schein, 1985), underlying member assumptions drive an organization's policies and practices and help shape its outward expressions (i.e., artifacts). By gaining insight into school staff and student thoughts on this issue, indoor and outdoor spaces may be used more effectively to promote physical activity. Additionally, these perceptions may better inform policies of school districts and ministries of education linked with new school development.

Research that attempts to go beyond the tangible (i.e., equipment provided, teacher delivery, class context) to access the root of physical activity behaviors in physical education is

needed. Most studies that explore the relationship between physical activity and physical education have done so at the artifacts level of school culture within middle and secondary schools. Future studies that focus on culturally specific activities, teacher support of modified curricular strategies, and physical education policies could offer a greater understanding of the underlying factors that impact student physical activity levels during physical education. These efforts should occur in conjunction with the examination of time available for physical education—which, at present, is showing mixed findings.

There is also a need to develop a better understanding of the relationship between physically active role models and school-based physical activity opportunities in all school contexts, especially elementary schools. To date, limited qualitative evidence collected from secondary school members suggests that adult and student role models who value physical activity influence school-based physical activity and opportunities for physical activity. Nevertheless, these findings have not been quantitatively confirmed. In addition, no studies have considered the relationship between school staff (teachers and administrators) physical activity levels and school culture. Research is important in this area because student physical activity levels are associated with teacher and principal values, attitudes, and behaviors surrounding physical activity (Barnett et al., 2006; Bauer et al., 2006; Bauer et al., 2004; Dyment & Bell, 2007; Dyment & Bell, 2007; Groft et al., 2005; MacQuarrie et al., 2008). Therefore, school staff are aware of the role they play in promoting physical activity, but very few studies have quantitatively confirmed this association.

In summary, this paper illustrates the complex relationship between school-based physical activity opportunities, student physical activity, and all levels of a school's cultural system. This review also draws attention to the multi-faceted nature of school culture that may,

in turn, be best studied across levels of culture using mixed methodologies. If researchers are to obtain a true sense of the factors that influence school-based physical activity and physical activity opportunities, they must access all layers of school culture to expose the core values and attitudes that reinforce school member behaviors.

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Appendix A:
Study Characteristics Categorized According to Schein's (1985) Cultural Levels

Study characteristic	Artifacts	Espoused values	Underlying member assumptions	Total
Number of studies	37	20	41	98
Year of Publication				
1999-2004	16	9	10	35
2005-2009	21	11	31	63
Country				
USA	8	15	13	36
UK/Europe	14	2	6	22
Canada	5	1	9	15
Australia/New Zealand	2		7	9
Asia	4	2	1	7
Other	1		3	4
Number of participants**				
0-500	19	8	30	57
501-999	2	6	5	13
≥1000	16	6	6	28
School Context +				
Elementary school	21	9	19	49
Middle school	13	9	8	30
High school	9	8	7	24
Not reported			2	2
Gender **				
Male	1171	13762	31038	45971
Female	5377	13543	59984	78904
Not specified (number of studies)	22	11	21	54
Physical activity measurement ǂ				
Quantitative:				
Accelerometer	8	5	1	14
Questionnaires	15	10	22	47
Direct observation	5	3	2	10
Heart rate monitor	4		8	12
Pedometers	1	3	1	5
Qualitative:				
Focus group interviews	6		10	16
Photovoice			2	2
Student drawings			1	1
Number of validated tools ∇				
Validated tools	27	20	10	57
Validity not reported	2	1	5	8

Descriptive studies:				
Quantitative	12	5	10	27
Qualitative	9	12	18	39
Mixed Methods	2	1	3	6
Intervention studies				
Quantitative	5	10	6	21
Qualitative			1	1
Mixed Methods	1	1	2	4
For experimental studies (n = 23): intervention length				
≤ 1 year	4	5	2	11
≥ 1 year	2	6	4	12

Note. ** includes parents, teachers, administrators, and students; + some studies occurred in more than one school context; ╪ some studies used more than one measure of physical activity; ∇ qualitative tools not considered here.

Appendix B:
Descriptive Studies That Measured Physical Activity in Relation to School Culture

Factors	Associations with physical activity	Studies
Artifacts		
Availability of physical activity equipment	+	(Haug, Torsheim, Sallis, et al., 2008; Haug, Torsheim, & Samdal, 2008; Zask et al., 2001)
Availability of physical activity facilities	++	(Barnett et al., 2006; Cohen et al., 2008; Haug, Torsheim, Sallis, et al., 2008; Haug, Torsheim, & Samdal, 2008; Nichol et al., 2009; Ommundsen et al., 2006; Williden et al., 2006)
Condition of physical activity facilities	+	(Nichol et al., 2009)
Storage space for physical activity equipment	+	(Barnett et al., 2006)
Being at school (vs. not at school)	+	(Barr-Anderson et al., 2007; Fairclough et al., 2008; Fein et al., 2004; Henry et al., 1999)
Physical space		
School outdoor grounds	+	(Haug, Torsheim, Sallis, et al., 2008; Haug, Torsheim, & Samdal, 2008)
School indoor space	0	(Cohen et al., 2006; Cohen et al., 2008)
School building square footage	+	(Cradock et al., 2007)
Total school campus area	0	(Allison & Adlaf, 2000; Cradock et al., 2007)
School play area per student	+	(Cradock et al., 2007)
School type		
Vocational vs. traditional schools	+	(Grunbaum, Lowry, & Kann, 2001; Lee, Clement, Tsang, & Cho-yee, 2001)
Espoused values		
Policies related to physical activity facility access	+	(Durant et al., 2009; Haug, Torsheim, & Samdal, 2008)
Physical education practices (i.e. number of physical education days/week, length of physical education classes)	0	(Durant et al., 2009; Li et al., 2006; Nguyen et al., 2009; O'Malley et al., 2009)
Policies that discourage active transportation	-	(Hohepa, Scragg, Schofield, Kolt, & Schaaf, 2007)
Policies related to physical activity opportunities	+	(Cohen et al., 2006; Eyler et al., 2008; Haug, Torsheim, & Samdal, 2008; Li et al., 2006; Wen et al., 2008)

School support for physical activity	+	(Hohepa et al., 2007)
Opportunities for school physical activity	++	(Barnett et al., 2006; Durant et al., 2009; Fein et al., 2004; Harrison & Narayan, 2003; Li et al., 2006; McKenzie et al., 2000b; Nichol et al., 2009; O'Malley et al., 2009; Ommundsen et al., 2006)
Underlying member assumptions		
Teacher modeling of physical activity	+	(Lei et al., 2004)
Principal interest in community physical activity links	+	(Barnett et al., 2006; Faulkner et al., 2009)
Teacher support for physical activity	+	(Ommundsen et al., 2006)
Principal modeling of physical activity	+	(Barnett et al., 2006)
School connectedness	+	(Faulkner et al., 2009)
Student relationship with physical education teacher	0	(Fein et al., 2004)
Student perception of the importance of physical activity	+	(Fein et al., 2004; Zhang et al., 2007)

Note. ++ refers to consistent, positive associations with physical activity; + refers to modest, positive associations with physical activity; 0 refers to no association with physical activity or mixed findings; – refers to modest, negative associations with physical activity; = refers to consistent, negative associations with physical activity.
Note. "Modest" indicates an association with an increase (+) or decrease (-) in physical activity but does not infer significance.

Appendix C:
Intervention Studies That Modified Aspects of School Culture to Enhance Physical Activity

Intervention (or aspects of)	Effects on physical activity	Studies
Artifacts		
Added playground markings	++	(Fitzgerald et al., 2009; Loucaides et al., 2009; Mulvihill et al., 2000; Ridgers et al., 2007; Stratton, 2000; Stratton & Leonard, 2002)
Provided physical activity equipment during leisure times	++	(Haerens et al., 2006; Loucaides et al., 2009; Ridgers et al., 2007; Stratton, 2000; Stratton & Leonard, 2002; Verstraete et al., 2006)
Espoused values		
Physical education credit incentives for physical activity outside of physical education	0	(Webber et al., 2008)
Links to community physical activity resources	+	(Manios et al., 1999; Webber et al., 2008; Wen et al., 2008)
Physical education practices (i.e. inclusion of lifestyle activities, small-sided games)	+	(Pate et al., 2005)
School promotion of active transportation	+	(Eyler et al., 2008; Haerens et al., 2006; Jurg et al., 2006; Kong et al., 2009)
Offered more physical activity opportunities	+	(Dzewaltowski et al., 2009; Haerens et al., 2006; Jurg et al., 2006; Loucaides et al., 2009; Mahar et al., 2006; Pangrazi et al., 2003; Sallis et al., 2003; Scruggs et al., 2003; Stewart et al., 2004; J. L. Thompson et al., 2001; Verstraete et al., 2006; Webber et al., 2008)
Underlying member assumptions		
Teacher led physical activity sessions	+	(Dzewaltowski et al., 2009; Ernst & Pangrazi, 1999; Haug, Torsheim, & Samdal, 2008; Loucaides et al., 2009; Mahar et al., 2006; Pangrazi et al., 2003; Pate et al., 2005; Scruggs et al., 2003; Stewart et al., 2004; J. L. Thompson et al., 2001; Verstraete et al., 2006)
Parent/child participation in school physical activity together	+	(Jurg et al., 2006)
Student directed physical activity sessions	+	(Wilson et al., 2005)
Specific cultural physical education activities	+	(Going et al., 2003; Pate et al., 2005; Wilson et al., 2005)
Physical activity workshops for parents, teachers, and students	+	(Manios et al., 1999; Wen et al., 2008)

Note. ++ refers to consistent, positive effects on physical activity; + refers to modest, positive effects on physical activity; 0 refers to no effect on physical activity or mixed findings; – refers to modest, negative effects on physical activity; = refers to consistent, negative effects on physical activity.
Note. "Modest" indicates an association with an increase (+) or decrease (-) in physical activity but does not infer significance.
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Appendix D:
Qualitative Studies Demonstrating Relationships Between School Culture and Physical Activity

Theme	Illustrative examples of themes	Studies with similar theme
Artifacts		
Lack of physical activity facilities	Principal: "At our school, physical education programs are not what they should be due to lack of indoor facilities."(Young et al., 2007) Parent: "One of the major barriers to physical activity at my child's school is the lack of facilities."(Williden et al., 2006)	(Crawford et al., 2008; Fitzgerald et al., 2009; Mulvihill et al., 2000; Naylor et al., 2006; A. M. Thompson et al., 2005; Williden et al., 2006; Young et al., 2007)
Lack of physical activity areas on school grounds	Student: "I wish there were more trees at my school –I do not have anywhere to hide."(Fitzgerald et al., 2009)	(Allison & Adlaf, 2000; Bauer et al., 2006; Bauer et al., 2004; Crawford et al., 2008; Dagkas & Stathi, 2007; J. E. Dyment & A. C. Bell, 2007; Fitzgerald et al., 2009; Hohepa et al., 2006; Kong et al., 2009; Lounsbery et al., 2007; Mulvihill et al., 2000; A. M. Thompson et al., 2005; J. L. Thompson et al., 2001)
Condition of physical activity facilities	Parent: "My child is not as active at school because of the poor condition of the playground and school grounds."(Mulvihill et al., 2000)	(Fitzgerald et al., 2009; Mulvihill et al., 2000)
Espoused values		
School physical activity practices	Parent: "One of the barriers to physical activity at my child's school is the lack of safe, supervised and maintained physical activity areas (e.g. playgrounds, school grounds)"(Mulvihill et al., 2000) Teacher: "Our school physical activity policies do not consider all student backgrounds and cultures."(MacQuarrie et al., 2008)	(Ahlport et al., 2008; Boyle et al., 2008; J. E. Dyment & A. C. Bell, 2007; J. E. Dyment & A. C. Bell, 2007; Eyler et al., 2008; Fitzgerald et al., 2009; Jennings-Aburto et al., 2009; Lounsbery et al., 2007; MacQuarrie et al., 2008; Monge-Rojas et al., 2009; Mulvihill et al., 2000; Naylor et al., 2006; Parks et al., 2007; Salmon et al., 2007; Schetzina et al., 2009; Williden et al., 2006; Young et al., 2007; Zhang et al., 2007)

Active transportation policies	Principal: "By providing crossing guards and walk to school days, children are walking to and from school more."(Eyler et al., 2008) Parent: "We do not walk to school because there is not direct route to walk to school."(Salmon et al., 2007)	(Eyler et al., 2008; Jennings-Aburto et al., 2009; Mulvihill et al., 2000; Salmon et al., 2007; Young et al., 2007)
Lack of school physical activity promotion	Student: "My teachers are always telling me to stop running."(Jennings-Aburto et al., 2009) Parent: "I do not let my child walk to school because there are no other children to walk with."(Salmon et al., 2007)	(Jennings-Aburto et al., 2009; Monge-Rojas et al., 2009; Salmon et al., 2007; Young et al., 2007)
Leisure times	Student: "I am more active outside, during recess than I am at home."(A. M. Thompson et al., 2005)	(Bauer et al., 2004; Crawford et al., 2008; Gyurcsik et al., 2006; Hohepa et al., 2006; Monge-Rojas et al., 2009; A. M. Thompson et al., 2005)
Access to physical activity equipment	Parent: "Schools should provide a range of outdoor sporting equipment during recess and break periods."(Crawford et al., 2008) Student: "If I had access to exercise equipment during my breaks, I would use it." (Gyurcsik et al., 2006)	(Bauer et al., 2004; Crawford et al., 2008; Gyurcsik et al., 2006)
Underlying member assumptions		
Lack of teacher role models	Teacher: "If I had more time at school, and my school valued physical activity, I would make an effort to be more active at school."(Schetzina et al., 2009)	(Barnett et al., 2006; J. E. Dyment & A. C. Bell, 2007; J. E. Dyment & A. C. Bell, 2007; Jennings-Aburto et al., 2009; Lei et al., 2004; MacQuarrie et al., 2008; Monge-Rojas et al., 2009; Naylor et al., 2006; Schetzina et al., 2009; A. M. Thompson et al., 2005)
Lack of opportunities for physical activity	Parent: "Our school needs to provide active opportunities to reward good behavior."(Crawford et al., 2008) Principal: "Staff perceive that our school environment is not conducive to physical activity; therefore, we offer very few extracurricular programs." (Lounsbery et al., 2007)	(Allison & Adlaf, 2000; Bauer et al., 2006; Bauer et al., 2004; Crawford et al., 2008; Dagkas & Stathi, 2007; J. E. Dyment & A. C. Bell, 2007; Hohepa et al., 2006; Lounsbery et al., 2007; Mulvihill et al., 2000; A. M. Thompson et al., 2005; J. L. Thompson et al., 2001)

Lack of teacher-coaches	Principal: "One of our greatest barriers to physical activity is the lack of teacher-coaches; teachers just do not have the time." (Lounsbery et al., 2007)	(Bauer et al., 2004; Lounsbery et al., 2007; A. M. Thompson et al., 2005)
Competition and activities in physical education	Student: "I do not really like physical education because all we do is play basketball."(Monge-Rojas et al., 2009) PE teacher: "The competitive nature of physical education activities encourages students to work harder."(Boyle et al., 2008)	(Bauer et al., 2004; Boyle et al., 2008; Monge-Rojas et al., 2009)
Teacher-student relationships	Teacher: "The students and staff work together to offer quality physical activity programs at our school."(MacQuarrie et al., 2008)	(J. E. Dyment & A. C. Bell, 2007; MacQuarrie et al., 2008)