ann. behav. med. (2013) 45 (Suppl 1):S131–S141
DOI 10.1007/s12160-012-9427-9

ORIGINAL ARTICLE

District and School Physical Education Policies: Implications for Physical Education and Recess Time

Monica A. F. Lounsbery, Ph.D. · Thomas L. McKenzie, Ph.D. · James R. Morrow Jr., Ph.D. · Shannon M. Monnat, Ph.D. · Kathryn A. Holt, M.S.

Published online: 19 January 2013

Abstract
Background The relationship between physical education (PE) policies and children's PE and recess time is not well understood.
Purpose The purpose of this study is to assess the association of district and school PE policies, the PE environment, and PE and recess time.
Methods Key informants in 65 schools from 9 states completed instruments assessing district and school PE policies, the school PE environment, and time in PE and recess.
Results Few significant associations were found between PE policies and PE or recess minutes; no policies were associated with both. A number of PE environmental variables were associated with both policies and time in PE and recess.
Conclusions PE policies, their implementation, and PE environmental variables can have important implications for recess time. Some school PE environment measures designed to improve PE may result in PE time limitations. Deficiencies in PE and recess time are not likely to be effectively addressed through policy adoption alone.

Keywords Physical education · Recess · School physical activity · Physical education policy · Physical activity policy

M. A. F. Lounsbery (✉) · S. M. Monnat · K. A. Holt
University of Nevada, Las Vegas,
Las Vegas, NV, USA
e-mail: monica.lounsbery@unlv.edu

T. L. McKenzie
San Diego State University,
San Diego, CA, USA

J. R. Morrow Jr.,
University of North Texas,
Denton, TX, USA

Introduction

Physical activity (PA) is essential to children's current and future health [1, 2], but most children do not meet the national recommendations of at least 60 min of moderate to vigorous PA (MVPA) daily [3]. This is particularly relevant given the recent increases in obesity and its associated problems, including high blood pressure, elevated cholesterol, and type 2 diabetes, which disproportionately affect minority and socio-economically disadvantaged children [4–7].

Targeting behaviors associated with PA and childhood obesity is now a public health priority [8–12], and ecological approaches have identified the importance of specific settings in bringing about behavior change. Ecological models conceptualize behavior as being influenced by the nature of the multidimensional social and physical environment [13, 14], and within this perspective, various environmental and policy strategies are aimed at guiding principles and procedures that relate to targeted behaviors [15–17].

School is a particularly salient environment for providing and promoting MVPA [16–23] because it is the only setting that reaches nearly all children, most of whom spend almost half their waking day at school for about 36 weeks a year for 12 years. In elementary schools, physical education (PE), recess, classroom PA breaks, and other before/during/after school programs all have been identified as being important contributors to MVPA accrual [18–23].

Since 1996, numerous public health agencies (e.g., US Surgeon General, Health and Human Services, the Centers for Disease Control and Prevention) and medical organizations (e.g., American Heart Association and American Academy of Pediatrics) have called for schools to adopt policies to promote and provide PA. The Child Nutrition and WIC Reauthorization Act of 2004 [24] mandated that,

by the start of the 2006/2007 school year, most local education agencies were to establish "a school wellness policy" that included goals for nutrition, PA, and other school-based activities designed to promote student wellness. However, PA policies vary widely and generally lack specificity, enforcement, accountability, and funding [23], and within the last decade, physical education and recess have been reduced and, in some cases, eliminated [25–28]. The federal reauthorization of the Elementary and Secondary Education Act of 2001, known as "No Child Left Behind," has especially led to reductions in PA programs and resources [26], and a recent nationally representative study found that only 17 % of US elementary schools provided 150 min of PE per week [29].

Approximately 34 million children in the US spend large amounts of time in elementary schools each day [28], and substantial financial investments have been made to develop and promote school PA policy recommendations (e.g., Institute of Medicine, Centers for Disease Control and Prevention). Meanwhile, the relationship between policies on children's access to PA programs (including program minutes) and children's actual engagement in PA is not well understood. Although there are some recent studies [29, 30], including those showing the effects of state policies in Texas [31, 32], research on school policy and environment as it relates to children's PA is limited, and it remains unclear how specific policies and environmental factors contribute to children's PA in schools.

We have conceptualized a multilevel ecological model that considers PA and the school environment in relation to state, district, and school PA policies. Figure 1 illustrates this model and shows the typical multiple levels of policy that have the potential to influence children's PA. While state and district policy may impact a school environment directly (e.g., school sizing and location), it is typical that state policy and its implementation impact district policy and this in turn impacts PA policy and environmental conditions at individual schools. We include school level policy in Fig. 1 because many school districts subscribe to site-based management that gives individual schools broad latitude in adopting policies and practices that comply with, but may also go beyond, district policies. This latitude may include, but is not limited to, policies about scheduling the school day, hiring staff, allocating budgets, and designing aspects of the curriculum and how it is delivered.

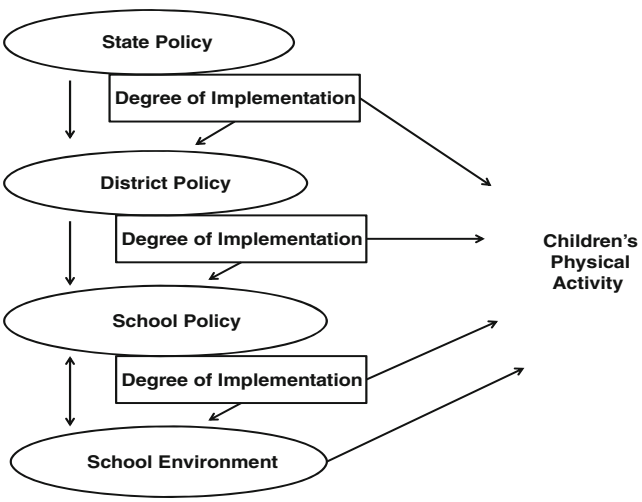

Fig. 1 Multilevel ecological model of school PA policy and children's PA

School environmental conditions (shown at the bottom of Fig. 1) are broad and diverse and include the built environment (e.g., facilities and activity areas) and other physical conditions (e.g., PE equipment, message boards), as well as organizational (e.g., how PE classes are scheduled, organized, and taught) and social aspects (e.g., the characteristics of and interactions among administrators, staff, and students). School environmental factors can impact the adoption of other unique policies, and collectively, all of these variables can have implications for an individual school, including the amount of time allocated for PE and recess programs. Lastly, the figure illustrates the relevance of policy implementation at each of these levels (state, district, and school policies) to acknowledge that differences in the extent to which policies are both adopted and implemented have important implications for children's physical activity levels.

We conceptualize policy implementation as a process that includes dissemination, evaluation, and accountability. Policy dissemination encompasses the information communicated and its targets (e.g., administration, teachers, staff, parents), mechanisms, and frequency. Policy evaluation involves the assessment of specific environmental indicators that, when present, provide an indication of the degree of policy implementation. Policy accountability includes procedures for follow-up and consequences for non-compliance. The process of implementation can result in considerable variation at all levels, culminating in substantial differences in how policies relate to children's physical activity.

Investigations on school PA policies are recent and most only describe policies [27, 29, 33] or relate them to PA participation estimates based on school administrator responses to questionnaires that are administered distally [34, 35]. Reports from school administrators about PE policy and other aspects of their school's PE program may be limited. Additionally, because school administrators are responsible for school outcomes, their responses may be susceptible to social desirability bias. Additionally, few school PA policy studies obtained school PE and recess time data directly from classroom teacher records. Hence, the main purpose of this study was to assess the association of elementary school district and school PE policies, school PE environment, and PE and recess time locally by working

with a designated school liaison and by obtaining PE and recess time from classroom teacher records.

Methods

Participants and Setting

To capture widespread social, cultural, and economic diversity germane to school PA policy and the PA opportunities that schools provide, we recruited the participation of 75 schools from three US geographic regions (west, mid-west, and east). To recruit schools we obtained the assistance of three regional coordinators who had previously conducted research in their geographic areas and then trained them on our protocols. All public elementary schools within the geographical region that included grades 1–6 were eligible for inclusion. After a school was selected at random, the regional coordinator contacted the principal to invite participation. Schools were offered a $50 PE equipment voucher for participating, and we obtained complete data for 65 schools (i.e., 87 % recruitment) that were in 27 different school districts and 9 states. Within each school, the person most knowledgeable about PE policies and school PA programs (typically the PE teacher) was selected to serve as the key informant and school liaison. This school liaison (a) served as the school contact for the study, (b) completed the School Physical Activity Policy Assessment (S-PAPA) instrument [36], and (c) worked with classroom teachers to ensure they followed the data collection procedures for Physical Activity Record for Classes (PARC) [37]. Institutional review board approval was obtained by the principal investigator, and the regional coordinators obtained formal consent from districts and schools according to the requirements for each school district.

Assessment of Weekly PE and Recess Minutes

We used the PARC instrument to obtain detailed information on PA opportunities available to classes during PE and recess time over two consecutive and uninterrupted weeks. PARC has previously been used by the investigators during the CATCH project [37] and in the validation of S-PAPA [36]. The liaison at each school trained and monitored one randomly selected primary (second grade) and one intermediate level (fourth grade) classroom teacher on the completion of the PARC forms, which they completed daily to provide the number of PE and recess minutes that each particular class received. Based on these data, the average weekly PE, recess, and total PARC (i.e., PE plus recess) minutes were calculated for each class and subsequently averaged to provide a school score.

District and School PA Policy and School PE Environment Assessment

To assess district and school level policy and related school PE environmental variables, the school liaison was trained to complete the School Physical Activity Policy Assessment (S-PAPA) instrument [36]. S-PAPA assesses district and school level PA policy and related school environmental variables and provides information about policy implementation at a school site. S-PAPA policy items assess the presence of district and school level policy areas (e.g., Does your school district have a written policy that requires a specific number of minutes per week or a specific number of days per week that students will have physical education?). The S-PAPA uses open-ended, dichotomous, multichotomous, and checklist formatting and has three distinct sections: (1) Physical Education, (2) Recess, and (3) Other Before/During/After School Programs. Reviews by experts and revisions based on pilot administrations indicated that the instrument has content and construct validity. As well, a test–retest administration showed that of 96 items tested, there was moderate to almost perfect agreement (kappas ranged from 0.42 to 0.87) on 89 items, while 7 had fair agreement (kappas ranged from 0.13 to 0.39) [36]. For the current study, we primarily used data from the Physical Education section (PE policy and PE-related environmental characteristics). Test–retest results of these items showed agreement ranging from moderate (kappa=0.41 to 0.60) to almost perfect agreement (kappa=0.81–0.99) [36]. In the current study, liaisons were directed, in instances of item response uncertainty, to seek advisement from other appropriate sources (e.g., school principals) to ensure complete and accurate information.

Evaluation of PA Policy Implementation

To assess the degree of implementation of the policies assessed by S-PAPA, we developed the School Physical Activity Policy Implementation Fidelity Index. This Index uses a checklist format to assess environmental artifacts that are indicators of policy implementation at a school. Each policy has a different set of implementation indicators and a rating of full, high, partial, low, or no implementation is assigned based on the number of indicators present for a given policy.

Assessing policy implementation requires examining varying and, in most cases, multiple data sources such as actual written policies, direct observations, and completed S-PAPA and PARC records. To identify indicators of implementation for each policy, we first reviewed the relevant literature to create a draft and then had elementary PE teachers, school administrators, and school wellness organization representatives review implementation indicators for

each policy. Additionally, elementary PE teachers provided feedback about the school generalizability of indicator items for each policy and about the scale that assigned the full, high, partial, low, or no policy implementation ratings.

Because not all data sources (e.g., direct observation) were available in the current study, we were unable to evaluate the implementation of all policies. We did, however, assess the degree of implementation for the following three district and school policies: (a) requirement for PE to follow specific standards, (b) requirement to provide a specific number of PE minutes or days per week, and (c) requirement to provide a specific number of recess minutes per day. Trained research staff evaluated the implementation of these policies using the Index. To assess inter-rater reliability, two staff members independently completed the Fidelity Index on 30 % (n=20) of the schools, and an inter-rater reliability of 0.89 was found.

Data Analyses

Descriptive statistics were used to illustrate the adoption and implementation of school policy and environmental variables and for weekly PE, recess, and total PARC minutes (i.e., PE and recess minutes combined). We calculated Pearson correlation coefficients to examine relationships between district and school level policies and weekly PE, recess, and PARC minutes. We used two-tailed t tests to examine differences in weekly PE and recess minutes in schools that did and did not adopt district and school level PE policies. We used correlation to examine the relationships between school and district policies and school PE environment characteristics. We conducted ordinary least squares (OLS) regression to examine whether any of the district or school level policies, degree of policy implementation, and any of the school PE environment variables significantly predicted PE or recess minutes. Tests for normality conducted prior to all analyses showed that both PE and recess minutes were normally distributed.

Results

Table 1 provides an overview of the characteristics of the participating 65 schools, including their enrollment, percentage of students eligible for free/reduced meal programs, and the amount of PE and recess they provided. There was substantial variability in the amount of time provided for PE and recess among schools, with the average being 62.5 (SD=30.5) PE minutes and 146.3 (SD=49.1) recess minutes per week. The mean total time for these PA programs (i.e., PARC minutes) was 208.8 (SD=57) minutes per week, with 70 % of it coming from recess. Most schools (88 %) reported that 100 % of their PE program was delivered by a PE specialist. The average PE class size was about 27 students, and only two schools reported class sizes exceeding 30 students.

Table 1 School profile (N=65 schools)

Variable	Mean±SD	Range
Characteristics		
Enrollment (number of students)	605±160.5	177–1050
Eligible for FRMP[a] (% students)	52.1±26.1	1–98
PE lessons (number per week)	1.7±0.7	1–5
PE scheduled length (min)	39.6 ± 9.2	30–60
Percent of PE taught by a PE specialist[b]	93.3±24.2	0–100
PE class size (number of students)	26.5±5.4	18–63
PE annual budget ($)	388.6±385.1	0–2000
Outcomes		
PE minutes (number per week)	63±30	30–250
Recess minutes (number per week)	146±49	0–232
PARC[c] minutes (number per week)	209±57	42–337

[a] Free or reduced meal plans

[b] 88 % of schools reported 100 % of PE lessons were taught by a PE specialist

[c] PARC minutes=sum of PE and recess minutes

Differences in PE and Recess Minutes in Schools with and without PE Policies

Table 2 lists 6 district- and school-level policies and shows the percentage of schools reporting adopting each policy and whether or not the number of minutes for PE and recess differed significantly between schools that had and did not have a specific policy. Results show that district PE policies were more likely to be in place than school PE policies and that there were policy adoption inconsistencies between the district and school levels. For example, 87 % of schools reported that they were in districts that had a policy requiring PE programs to follow external standards for PE, but only 47 % of schools had this same policy. Results of t test comparisons showed that there were few significant differences in PE and recess time between schools that had a specific policy and those that did not. Indeed, only one policy appeared to be strongly related to PE minutes and to recess minutes. On average, schools with a policy for their PE program to be evaluated annually had significantly more PE time (i.e., 96 min/week) than those that did not, but few districts or schools had this policy in place. Meanwhile, schools in a district with a policy requiring a specific number of minutes or days of PE per week and schools with a policy requiring the PE program to follow specific PE

Table 2 Mean (SD) PE and recess minutes for adopters and non-adopters of specific district and school level policies

	% Adopted[a] (*N*)	PE minutes		Recess minutes	
Written district policies		Policy	No policy	Policy	No policy
Requiring schools to follow PE standards	87 (52)	62.7(32.3)	59.5(21.2)	147.5(48.9)	133.3(47.8)
Specifying teachers must assign grades for PE	85 (52)	62.1 (31.0)	69.6 (29.6)	149.1 (49.1)	137.2 (49.5)
Specifying number of PE minutes/days per week	68 (41)	60.9 (19.5)	68.6 (47.8)	*159.6 (43.4)*	*122.9 (40.6)*
Requiring PE programs to test fitness	67 (21)	65.8 (17.1)	60.3 (35.8)	152.6 (55.6)	141.0 (45.7)
Specifying the maximum student-to-teacher ratio for PE	24 (12)	53.1 (12.5)	66.9 (37.0)	132.6 (42.5)	147.6 (48.3)
Requiring annual PE program evaluation	16 (9)	80.4 (64.6)	58.8 (21.8)	135.1 (48.2)	143.6 (51.8)
Written school policies					
Requiring schools to follow PE standards	47 (28)	67.5 (41.1)	58.3 (16.5)	*158.0 (44.4)*	*131.8 (50.4)*
Specifying teachers must assign grades for PE	77 (49)	61.2 (32.7)	64.8 (22.4)	141.6 (49.3)	158.4 (47.5)
Specifying number of PE minutes/days per week	56 (35)	59.7 (20.2)	67.9 (40.0)	155.7 (49.0)	135.1 (48.0)
Requiring PE programs to test fitness	22 (14)	62.4 (14.7)	62.5 (33.7)	145.1 (49.7)	146.6 (49.4)
Specifying the maximum student-to-teacher ratio for PE	12 (6)	50.2 (17.1)	65.7 (34.0)	131.6 (52.7)	149.2 (46.1)
Requiring annual PE program evaluation	4 (2)	155.0 (134.4)	58.7 (20.1)	103.5 (23.3)	147.7 (46.1)

Differences of means tests (two-tailed tests); Italicized values indicate significant difference in means between schools with and without policy at the $p<0.05$ or smaller

[a] Percent adopted reflects the percentage of schools that indicated they had the policy out of only the valid responses—missing are not included

standards and guidelines had significantly more recess minutes than schools without these policies.

Policy Adoption and Degree of Implementation

Data from the S-PAPA instrument permitted an assessment of the degree of implementation of three district and three school policies. Table 3 lists these policies, the percentage of schools adopting each policy, and the percentage of schools that had full, high, partial, low, or no implementation of each. Eighty-seven percent of the schools in the sample were in districts that had a written policy requiring PE to follow standards; of these schools, 73 % either fully or highly implemented the policy. In contrast, only 47 % of schools had a written policy that PE should follow standards; of these schools, most (85 %) either fully or highly implemented the policy. Meanwhile, few schools either fully or highly implemented district or school policies that specified the minutes or days per week for PE or the recess minutes per day.

We ran a series of OLS regression models to examine the relationship between the degree of policy implementation and the number of school PARC minutes (results not shown but available upon request). Although most policies were not significantly associated with school PARC minutes, there were two important findings. First, compared to schools not having a policy specifying the required number

Table 3 Adopted district and school policies and degree of implementation

	% Degree of implementation					
	% Adopted	Full (%)	High (%)	Partial (%)	Low (%)	No (%)
District policies						
Requiring schools to follow PE standards	87	41	32	21	6	0
Specifying number of PE minutes/days per week	68	8	16	24	41	11
Specifying number of recess minutes per day	38	12	12	19	58	0
School policies						
Requiring schools to follow PE standards	47	54	31	11	4	0
Specifying number of PE minutes/days per week	56	9	16	22	41	12
Specifying number of recess minutes per day	58	9	15	30	46	0

Data collected from the School Physical Activity Policy Implementation Fidelity Index

of PE minutes or days per week, schools having the policy and at least partially implementing the policy had significantly more PARC (combined PE and recess) minutes. Specifically, schools that at least partially implemented a school level policy specifying the number of PE minutes or days per week had on average 36 more weekly PARC minutes than schools without the policy (β=35.6, p<0.05). Second, schools at least partially implementing a *district level* policy specifying required PE minutes or days per week had on average about 50 more PARC minutes weekly than schools without the district policy (β=50.1, p<0.01).

PE Policy and the PE Environment

We analyzed the relationship between the existence of PE policies and school PE environmental variables measured by S-PAPA using Pearson Correlation Coefficients and found a substantial number of significant associations for each district and school policy. However, policies at the district level had a greater number of significant correlations with school PE environmental variables than did policies at the school level. To illustrate the nature of the school PE environmental variables assessed and the number of significant correlations with different district level policies, the correlations between district policies and selected school PE environment variables are presented in Table 4. The district policies with the greatest number of significant correlations with school PE environment variables were those requiring schools to follow specific PE standards or guidelines, requiring a specific number of minutes or days per week of PE instruction, and requiring schools to test students' fitness levels. Interestingly, the district policy of requiring a specific number of days or minutes per week of PE and that requiring schools to test students' fitness levels were inversely related to the scheduled length of PE classes. Overall, these data generally show that policies are related to a number of school PE environment variables and especially those related to PE content and its delivery.

PE Policy and PE Environment Predictors of PE and Recess Time

Table 5 presents the results of OLS regression models that examined PE policies (district and school level) and school PE environment predictors of weekly PE and recess time in schools. The only policy predictor of PE minutes was the school policy requiring the PE program to be evaluated annually. Schools that had this policy provided an average of 96 more PE minutes per week than those without the policy. However, few schools had this policy in place, and therefore, this result should be interpreted with caution. Two PE policies were positively associated with more recess time. First, schools reporting that their district had a policy requiring a specific number of PE minutes or days per week had an average of almost 37 more minutes of recess weekly than schools in districts without this policy. Second, schools with a policy requiring the PE program to follow specific PE standards or guidelines provided an average of over 26 more minutes of recess weekly than schools without the policy.

Relative to school PE environmental predictors of PE and recess time, facility characteristics were not significantly associated with PE minutes, but they were significantly associated with recess minutes. Schools with a gymnasium available for PE had significantly fewer recess minutes than schools not having one. In contrast, schools with a multipurpose room available for PE had an average of about 40 more weekly recess minutes than schools without one. Additionally, schools indicating (a) that 100 % of their PE was taught by a certified teacher and (b) that their PE class sizes were smaller or similar to those of other classes had significantly less PE time than schools without these characteristics. Meanwhile, schools with more students per licensed PE teacher provided more PE minutes per week (β=1.803, SE=0.663, p<0.05). Several of the PE content, curriculum, and delivery characteristics were negatively associated with PE time, including teachers being required to use a specific curricula and the amount of time PE spent addressing physical and motor skill development, active participation in PA, and personal and social behavior development.

Several PE environmental variables were positively associated with weekly recess time. Specifically, schools in which teachers were provided with PE goals, objectives, and expected outcomes, PE curricula, lesson plans, and learning activities and where teachers were required to use specific curricula, address physical fitness development frequently, address valuing PA for health benefits beyond PE, and where PE was rarely/never withheld for disciplinary reasons provided significantly more recess weekly than schools that did not. Finally, we found that the scheduled length of PE classes was inversely associated with recess time; for each additional minute of PE, recess time was reduced by about 1.8 min (β=1.763, SE=0.631, p<0.05).

Discussion

General Findings

In general we found that there were few significant associations between district or school PE policies and PE and recess time and that there were few significant differences in mean PE and recess times between schools with and without various policies. We did, however, find numerous significant associations between PE policies and school PE

Table 4 Correlations between district policies and selected school PE environment variables

	D1	D2	D3	D4	D5	D6
General PE profile						
100 % of PE taught by certified PE teacher	*0.360*	*0.311*	0.227	0.036	*0.430*	0.165
School has budget for PE equipment	0.125	−0.099	0.244	0.069	0.019	0.163
Average number of annual PE staff development hours[a]	0.167	*0.293*	0.155	*0.322*	0.233	0.030
PE delivery and content						
PE teachers provided with goals, objectives, and expected outcomes	*0.432*	*0.355*	0.031	*0.429*	0.219	0.138
PE teachers provided with PE curriculum	*0.429*	*0.367*	0.061	*0.430*	0.213	0.077
PE teachers provided with chart describing scope and sequence of instruction	*0.294*	0.251	0.116	*0.449*	0.159	0.080
PE teachers provided with specific lesson plans/learning activities	*0.350*	*0.468*	0.215	*0.476*	0.233	0.130
PE teachers provided with plans on how to assess or evaluate students	*0.340*	*0.415*	−0.026	*0.299*	0.099	0.163
PE teachers required to use specific curriculum	0.251	*0.369*	0.121	*0.408*	0.233	0.130
PE often addresses physical/motor skills development	0.135	0.249	−0.007	0.184	0.077	−0.067
PE often addresses understanding movement concepts, principles, strategies, and tactics	0.207	*0.367*	0.185	*0.278*	*0.277*	−0.028
PE often addresses expressive movement patterns (e.g., dance, creativity)	*0.294*	*0.394*	0.116	*0.270*	0.224	0.211
PE often addresses promoting active participation in PA	−0.090	*0.273*	0.142	0.158	0.119	−0.112
PE often addresses physical fitness development	0.196	0.184	0.208	0.143	0.140	0.018
PE often addresses responsible personal and social behavior development	0.033	0.012	−0.007	0.115	0.018	−0.163
PE often addresses valuing PA for health benefits beyond PE	0.247	0.216	0.263	0.148	*0.315*	0.094
Scheduled length of typical PE class period (minutes)	−0.208	*−0.320*	−0.031	*−0.451*	−0.172	−0.043
PE rarely/never withheld so students can fulfill other academic requirements	0.216	0.037	0.123	0.079	−0.192	0.197
PE rarely/never withheld from students for disciplinary reasons	0.085	−0.059	0.116	0.045	0.039	−0.033
Delivery of PE rarely/never compromised due to competing demands for space	0.107	0.042	0.067	−0.041	0.112	−0.116
PE classes are cancelled 1 or fewer days per semester	*0.328*	0.134	0.114	*0.264*	0.083	0.184

Italicized correlations significant at $p<0.05$ or smaller

D1 policy requiring schools to follow specific PE standards or guidelines; *D2* policy requiring specific minutes or days per weeks that students will have PE; *D3* policy specifying maximum student-to-teacher ratio for PE; *D4* policy requiring school PE program to test students' fitness levels; *D5* policy that teachers must assign grades for PE; *D6* policy requiring PE program to be evaluated annually

[a] All district policies are binary (yes/no). All school environmental variables are binary (yes/no) except average number of annual PE staff development hours

environmental variables and that there were far more significant associations for district than school level policies (see Table 4). Additionally, various school PE environmental variables were found to be significantly associated with reduced PE time but more recess time (Table 5). This inverse association between PE and recess minutes was also found in a recent investigation using a nationally representative sample [29]. In that study, the authors concluded that schools possibly substitute one form of physical activity for another rather than providing the recommended levels of both PE and recess [29]. Our study supports this conclusion, and we further add that PE and recess time may draw from the same time and resource allocations and that this, in part, may be due to policy specifications. For example, a district policy might require that schools provide at least 30 min of physical activity daily, permitting schools to meet the provision in different ways, including adjusting time for PE or recess.

In general, our findings also suggest that even though PE policies may not directly impact school PE and recess time, they may relate to numerous school PE environmental variables that are subsequently associated with PE and recess minutes. Additionally, we found more positive associations between PE policies and PE environmental variables for recess time than for PE time. We also found several unexpected negative associations, such as reduced PE time being related to 100 % of PE being taught by a certified PE teacher, smaller/similar PE class sizes compared to other classes, and several PE content and delivery characteristics.

Most schools had class sizes around 27 students, and 100 % of their PE was provided by a PE teacher. Although we did not assess the number of PE teachers in a school, our previous study of 154 elementary schools from 34 states had a median number of one PE teacher per school [38]. As a result, we suspect that, in the current study, almost all schools had PE delivered to small classes of students by a

Table 5 Significant policy and environmental predictors of physical education and recess minutes

	β	(SE)	R^2	N
PE minutes				
Policy				
School policy that requires the PE program to be evaluated annually	96.311	(19.575)	0.31	55
Environmental				
100 % of PE taught by certified teacher (ref=no)	−23.922	(11.203)	0.68	65
Similar/smaller PE class size than other classes (ref=larger class size)	−51.191	(11.480)	0.24	65
Average student-to-licensed PE teacher ratio in PE classes	1.803	(0.663)	0.12	56
PE teachers required to use specific curriculum (ref=no)	−16.101	(7.425)	0.07	65
PE often addresses physical/motor skills development (ref=rarely/sometimes)	−44.744	(14.825)	0.13	65
PE often addresses promoting active participation in PA (ref=rarely/sometimes)	−66.693	(16.106)	0.21	65
PE often addresses personal and social behavior development (ref=rarely/sometimes)	−39.127	(12.210)	0.14	65
Recess minutes				
Policy				
District policy requiring specific number of PE minutes or days per week	36.755	(11.807)	0.14	60
School policy requiring school to follow specific PE standards or guidelines	26.204	(12.430)	0.07	59
Environmental				
Gymnasium available for PE (ref=no)	−45.038	(11.826)	0.19	65
Multipurpose room/cafeteria available for PE (ref=no)	40.381	(11.204)	0.17	65
Per pupil expenditure on PE equipment per year ($)	−37.391	(11.458)	0.16	57
PE teachers provided with goals, objectives, and expected outcomes (ref=no)	26.430	(12.529)	0.07	65
PE teachers provided with PE curriculum (ref=no)	35.242	(12.969)	0.11	65
PE teachers provided with specific lesson plans/learning activities (ref=no)	45.709	(10.968)	0.22	65
PE teachers required to use specific curriculum (ref=no)	30.921	(11.759)	0.10	65
PE often addresses physical fitness developed (ref=rarely/sometimes)	66.193	(17.945)	0.18	65
PE often addresses valuing PA for health benefits beyond PE (ref=rarely/sometimes)	48.469	(15.177)	0.14	65
Scheduled length of typical PE class period (min)	−1.763	(0.631)	0.11	65
PE rarely/never withheld from students for disciplinary reasons (ref=sometimes/often)	24.119	(11.900)	0.06	65

Betas are significant at the $p<0.05$ level or smaller

SE standard error

single PE teacher. As well, reported scheduled PE class length ranged between 30 and 60 min, with schools typically providing 30- (39 %), 40- (22 %), or 45- (17 %) minute lessons. Each of these dynamics (i.e., all PE taught by a specialist, one specialist teacher in a school, class sizes under 30, and lesson length) plays an important role in the logistics of scheduling classes and activity space, and they pose limits to how much PE individual students in a school can receive. This notion is supported by the findings that (a) PE lesson length was negatively associated with the district level policy specifying the number PE minutes or days per week (see Table 4) and (b) OLS regression analyses showing schools with small class sizes and 100 % of PE taught by a PE specialist had significantly fewer PE minutes than schools without these characteristics (see Table 5).

Ironically, having smaller classes (e.g., 30 or fewer students) and certified PE teachers are commonly recommended policy and environmental measures for improving PE [10, 21], and when implemented, both have been shown to increase children's MVPA accrual during lessons [30, 39, 40]. Adopting these strategies, however, may restrict the number of overall PE minutes that individual students can receive when there is only one PE teacher, and there is limited activity space. Policy makers and proponents should consider strategies that increase PE minutes while maintaining lesson quality, such as hiring more PE teachers or having students receiving PE from a specialist on some days and from PE-trained classroom teachers on others.

PE Policies and Association with PE and Recess Time

PE policies assessed by S-PAPA were more prevalent at the district level than the school level, indicating that the presence of a district policy does not always translate to schools having a formalized written policy of their own (Table 2).

Additionally, while there were some instances of a school having a written policy that was not present at the district level, our results suggest that the adoption of a policy by a school is unlikely if it is not present at the district level. The translations of PE policies from higher governing structures (i.e., state and district) to the school level and the development of unique policies at the school level are not well understood, and much more work is needed to identify critical mechanisms related to these processes. Nonetheless, our previous research has shown that school principals and PE teachers (a) can and often do interact with one another about PA programs both within the school and with their counterparts from other schools and (b) that these interactions may have important implications for PA policy adoption and/or degree of policy implementation [38]. Further, findings from that study suggest that the adoption and translation of policies from the district to the school level require the initiative of a person (e.g., a "program champion") who is specifically in charge of PE, such as a district PE coordinator [40]. Without someone in this position, PE and its improvement are not likely to be a district priority, and communication with school level administrators and PE teachers about PE and other activity programs is unlikely.

The primary focus of this study was on PE policies, and it is interesting that they were more frequently associated with recess time than PE time. This finding may be an anomaly, or it may be that when PE policies are in place, a generalized school value for providing other PA programming such as recess may result. In support of the latter notion, Kelder and colleagues [32] found that school districts with stronger support and training for coordinated school health and higher MVPA during PE also provided increased recess time.

The school policy requiring annual evaluation of PE programs was significantly and positively associated with PE time in all of our analyses (correlation, difference of means test, and OLS regression); its adoption, however, was rare. Schools in a previous study were also found to rarely evaluate their PE programs [38], and yet, principals and PE teachers in those schools reported being very satisfied with the outcomes of their programs. Thus, we believe that there is emerging and growing evidence that annual PE program evaluation is a critical policy that has the potential to improve both the quantity and quality of PE programs.

Policy Adoption and Degree of Implementation

The results suggest that while schools report having adopted policies, the full implementation of these policies should not be assumed. Indeed, full and high implementation for policies specifying time allocations (e.g., minutes or days of PE per week) was rare. In our previous work [38], school principals reported a lack of time in the school day to be a top barrier to PE; thus, while additional PE or recess time may be valued, traditional scheduling practices, competing priorities, and limited PE personnel may make the implementation of time-related policies challenging. Schools fully implementing these policies may be able to provide important insight into strategies for overcoming barriers, and identifying specific strategies may lead to policy intervention studies where the generalizability of strategies can be assessed. In the interim, it is important to consider that schools that even partially implemented the time-related PE policies provided substantially more PARC minutes (i.e., total PE and recess time) than schools that did not. This finding suggests that policy adoption is critical, even if full implementation does not occur.

PE Policies and the School PE environment

As highlighted previously, we found a substantial number of associations between district and school PE policies and school PE environmental variables, and these variables are related to PE and recess minutes. Additionally, when the same PE policy was adopted at both the district and school levels, we found that more district level policies were significantly associated with school environmental variables than were school level policies. This finding may suggest that having district level PE policies is more critical than having school level policies. An exception, however, was with the importance of the school policy requiring annual PE program evaluation, which may suggest that when a school is held accountable for meeting PE outcomes, there is a higher likelihood that PE will be prioritized differently. A major limitation to this finding is that so few districts and schools had a policy requiring an annual program evaluation. Nonetheless, the importance of policies requiring schools to evaluate PE programs and report outcome metrics to improve PE has been suggested previously [29, 38].

Predictors of PE and Recess Minutes

The results demonstrated that few PE policies were significant predictors of the number of weekly PE or recess minutes, providing further substantiation that the provision of PE and recess time is complex and that time deficiencies will likely not be remediated by policy alone.

Another finding was that nearly all of the policy and school PE environmental variables were negatively associated with weekly PE minutes. It is interesting that these negative associations were for environmental measures that are frequently taken to improve PE delivery. Thus, as identified in the general findings section, some school measures

that are taken to address the quality of PE may actually limit the overall amount of PE time.

There were several significant predictors of weekly recess minutes. School PE environment variables related to improving the delivery of PE were positively associated with weekly recess minutes. Together, these data further support the notion that there are important implications for recess time when schools adopt PE policies and implement environmental strategies to improve PE.

Limitations

The study was confined to three US regions and by having a small number of schools (n=65) and school districts (n= 27), statistical power and generalizability are limited. We also recognize that multilevel modeling with schools being clustered within districts would help disentangle district vs. school level variation in PE and recess time, and future research should aim to collect information from a larger sample of schools. The study also relied on the school liaison and classroom teachers to provide accurate data, and there is the possibility of respondent social desirability bias. We did, however, take measures to reduce the potential of social desirability by directing school liaisons to make inquiries of other school officials when they were uncertain of a response on an S-PAPA item. Similar to other PE policy studies, there were challenges with assessing the degree of policy implementation, and we were able to assess the degree of implementation of only six policies. The data we did obtain, however, indicated strongly that full implementation of policies should not be assumed. Hence, our association analyses are limited to *reports* of policy adoption rather than actual policies that were fully implemented.

Conclusions

The results of this study suggest that district PE policy adoption may serve as a catalyst for school PE policy adoption. The translation of policies from the district to the school level is far from 100 %, and future studies should attempt to identify critical mechanisms that are associated with or predict policy adoption to different levels. Additionally, because school PE environmental factors were associated more often with district than school level policies, having district policies for PE may be more critical than having school policies. The school level policy requiring annual PE program evaluation is an exception, however, given its association with PE time and large number of school PE environmental variables.

This study also found that certain measures to improve the quality of PE delivery (e.g., small class sizes and PE taught by a certified teacher) pose logistical challenges to the number of weekly PE minutes individual students can receive. Despite these logistical challenges, we found that when policy and environmental factors that target improved PE quality were in place, there were positive implications for recess time.

Overall, the findings of this study support our multilevel ecological model of school PA policy and children's PA identified in Fig. 1. While there were limitations to assess the degree of policy implementation, we found that when policies were implemented at least partially, there were important implications for increased total PE and recess time. As well, both district and school level PE policies were related to a number of school PE environment variables and that several environmental variables were predictors of PE and recess time. Based on these findings, we believe that the multilevel ecological model portrayed in Fig. 1 may be a generalizable framework and suitable for guiding other school PA policy studies.

Acknowledgments This project was supported by a grant (number 67113) from Active Living Research, a National Program of the Robert Wood Johnson Foundation. We wish to thank Drs. Aaron Beighle, Michael Kanters, Hans van der Mars, and Alex Vigo for their assistance in this study. The S-PAPA instrument is available from Active Living Research at: http://www.activelivingresearch.org/node/12238

Conflict of Interest The authors have no conflict of interest to disclose.

References

1. US Department of Health and Human Services. *2008 Physical Activity Guidelines for Americans*. Washington: US Department of Health and Human Services; 2008.
2. Strong W, Malina RM, Blimkie CJR, et al. Evidence based physical activity for school-age youth. *J Pediatr*. 2005;146:732-737.
3. Troiano R, Berrigan D, Dodd K, et al. Physical activity in the United States measured by accelerometer. *Med Sci Sports Exerc*. 2008;40:181-188.
4. Anderson SE, Whitaker RC. Prevalence of obesity among US preschool children in different racial and ethnic groups. *Arch Pediatr Adoles Med*. 2009;163(4):344-348.
5. Daniels SR, Jacobson MS, McCrindle BW, et al. American Heart Association childhood obesity research summit: Executive summary. *Circulation*. 2009;119:2114-2123.
6. Han JC, Lawlor DA, Kimm SYS. Childhood obesity. *Lancet*. 2010;375(9727):1737-1748.
7. Ogden C, Carroll M, Curtin L, Lamb M, Flegal K. Prevalence of high body mass index in US children and adolescents, 2007–2008. *JAMA*. 2010;303:242-249.
8. Brown T, Summerbell C. Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: An update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. *Obes Rev*. 2009;10(1):110-141.
9. McCall A, Raj R. Exercise for prevention of obesity and diabetes in children and adolescents. *Clin Sports Med*. 2009;28(3):393-421.

10. National Association of State Boards of Education. Fit, healthy, and ready to learn: A school health policy guide; 2000. Available at http://www.nasbe.org/index.php/shs/53-shs-resources/396-fit-healthy-and-ready-to-learn-a-school-healthpolicy-%20guide. Accessed February 15, 2011.
11. U.S. Department of Health and Human Services. *The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity*. Rockville: US Department of Health and Human Services, Public Health Services; 2001.
12. US Department of Health and Human Services. Healthy People 2020. Washington: US Department of Health and Human Services; 2010. Available at http://www.healthypeople.gov/2020/topicsobjectives2020/pdfs/HP2020objectives.pdf. Accessed March 18, 2012.
13. McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health promotion programs. *Health Educ Behav*. 1998;15(4):351-377.
14. Sallis JF, Cervero RB, Ascher W, Henderson KA, Kraft MK, Kerr J. An ecological approach to creating active living communities. *Annu Rev Public Health*. 2006;27:297-322.
15. Brownson RC, Baker EA, Housemann RA, Brennan LK, Bacak SJ. Environmental and policy determinants of physical activity in the United States. *Am J Public Health*. 2001;91(12):1995-2003.
16. Sallis JF, Bauman A, Pratt M. Environmental and policy interventions to promote physical activity. *Am J Prev Med*. 1998;15(4):379-397.
17. Sallis JF, McKenzie TL, Conway TL, et al. Environmental interventions for eating and physical activity: A randomized controlled trial in middle schools. *Am J Prev Med*. 2003;24(3):209-217.
18. Partnership for Prevention. *School-Based Physical Education: Working with Schools to Increase Physical Activity Among Children and Adolescents in Physical Education Classes—An Action Guide. The Community Health Promotion Handbook: Action Guides to Improve Community Health*. Washington: Partnership for Prevention; 2008.
19. Pate RR, Davis MG, Robinson TN, et al. Promoting physical activity in children and youth: A leadership role for schools. *Circulation*. 2006;114:1214-1224.
20. Payne VG, Morrow JR. School physical education as a viable change agent to increase youth physical activity. *Res Digest*. 2009;10(2):1-8.
21. Centers for Disease Control and Prevention. School health guidelines to promote healthy eating and physical activity. *MMWR*. 2011;60(RR05):1-71.
22. Story M, Nanney MS, Schwartz MB. Schools and obesity prevention: Creating school environments and policies to promote healthy eating and physical activity. *Milbank Q*. 2009;87(1):71-100.
23. Robert Wood Johnson Foundation. Local school wellness policies: How are schools implementing the congressional mandate? RWJF Policy Brief; 2009. Available at http://www.activelivingresearch.org/files/ALR_Brief_LocalWellnessPolicies.pdf. Accessed March 19, 2012.
24. Public Law 108-265. 108th Congress, June 30, 2004. Available at http://www.fns.usda.gov/cnd/governance/legislation/historical/pl_108-265.pdf. Accessed July 7, 2012.
25. McKenzie TL, Lounsbery MAF. School physical education: The pill not taken. *J Lifestyle Med*. 2009;3:219-225.
26. McMurrer J. Instructional time in elementary schools: A closer look at changes for specific subjects. A report in the series from the capital to the classroom: Year 5 of the No Child Left Behind Act. Center on Educational Policy; 2008. Available at http://www.cep-dc.org/. Accessed March 19, 2012.
27. Lee SM, Burgeson CR, Fulton JE, Spain CG. Physical education and physical activity: Results from the school health policies and programs study 2006. *J Sch Health*. 2007;77(8):435-463.
28. U.S. Department of Education, National Center for Education Statistics. Digest of Education Statistics, 2007 (NCES 2008-022), Chapter 1; 2008. Available at http://nces.ed.gov/fastfacts/display.asp?id=65. Accessed March 19, 2012.
29. Slater SJ, Nicholson L, Chriqui J, Turner L, Chaloupka F. The impact of state laws and district policies on physical education and recess practices in a nationally representative sample of US public elementary schools. *Arch Pediatr Adolesc Med*. 2012;166(4):311-316.
30. Skala KA, Springer A, Sharma S, Hoelscher DM, Kelder SH. Environmental characteristics and student physical activity in PE Class: Findings from two large urban areas of Texas. *J Physical Activity Health*. 2012;9(4):481-491.
31. Barroso C, Kelder SH, Springer AE, et al. Texas Senate Bill 42: Implementation and impact on physical activity in middle schools. *J Adoles Health*. 2009;45(3 Suppl 1):S82-S90.
32. Kelder SH, Springer AE, Barroso C, et al. The Impact of Texas Senate Bill 19 on elementary school children's level of physical activity. *J Public Health Policy*. 2009;30(Suppl 1):S221-S247.
33. Heinrich KM, Johnson CB, Jokura Y, Nett B, Maddock JE. A survey of policies and local ordinances supporting physical activity in Hawaii counties. Prev Chronic Disease. 2008;5(1),1-7. Available at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2248783/pdf/PCD51A19.pdf. Accessed March 19, 2012.
34. O'Malley PM, Johnston LD, Delva J, Terry-McElrath YM. School physical activity environment related to student obesity and activity: A national study of schools and students. *J Adoles Health*. 2009;45:S71-S81.
35. Fernandes M, Sturm R. Facility provision in elementary schools: correlates with physical education, recess, and obesity. *Prev Med*. 2010;50(Suppl 1):S30-S35.
36. Lounsbery MAF, McKenzie TL, Morrow JR, Holt KA, Budnar RG. School Physical Activity Policy Assessment (S-PAPA): Test–retest reliabilities. J Phys. Act Health. 2012, in press.
37. McKenzie TL, Strikmiller PK, Stone EJ, et al. CATCH: Physical activity process evaluation in a multicenter trial. *Health Educ Q*. 1994;1994(Suppl 2):S73-S89.
38. Lounsbery MAF, McKenzie TL, Trost SG, Smith NJ. Facilitators and barriers to adopting evidence-based physical education in elementary schools. *J Physical Activity Health*. 2011;8(Suppl 1):S17-S25.
39. McKenzie TL, Marshall SJ, Sallis JF, Conway TL. Student activity levels, lesson context, and teacher behavior during middle school physical education. *Res Q Exerc Sport*. 2000;71:249-259.
40. Sallis JF, McKenzie TL, Alcaraz JE, et al. The effects of a 2-year physical education program (SPARK) on physical activity and fitness in elementary school students. *Am J Public Health*. 1997;87:1328-1334.