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Association of environment and policy characteristics on children's moderate-to-vigorous physical activity and time spent sedentary in afterschool programs

Rahma Ajja [a,*], Morgan N. Clennin [a], R. Glenn Weaver [a], Justin B. Moore [b], Jennifer L. Huberty [c], Dianne S. Ward [d], Russell R. Pate [a], Michael W. Beets [a]

[a] Department of Exercise Science, Arnold School of Public Health, University of South Carolina, Columbia, SC, United States
[b] Department of Health Promotion, Education, and Behavior, Arnold School of Public Health, University of South Carolina, Columbia, SC, United States
[c] School of Nutrition and Health Promotion, College of Health Solutions, Arizona State University, Phoenix, AZ, United States
[d] Department of Nutrition, Schools of Public Health and Medicine, University of North Carolina at Chapel Hill, Chapel Hill, NC, United States

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ABSTRACT

Background: Afterschool programs are an important setting in which to promote children's physical activity. This study examines the association of environmental and policy characteristics on the moderate-to-vigorous physical activity and sedentary behavior of children attending afterschool programs.

Methods: A total of 1302 children attending 20 afterschool programs across South Carolina wore accelerometers (ActiGraph GT3X+) for up to 4 non-consecutive days. Policy-level characteristics were evaluated using the Healthy Afterschool Program Index-Physical Activity scale. Physical activity space was measured using a measuring wheel (indoor, ft^2) and Geographical Information Systems software (outdoor, acres). The structure (free-play or organized) of activity opportunities was evaluated via direct observation. Time spent in moderate-to-vigorous physical activity and sedentary, both indoors and outdoors, was estimated using accelerometry.

Results: For every 5000 ft^2 of utilized indoor activity space an additional 2.4 and 3.3 min/day of sedentary behavior was observed among boys and girls, respectively. A higher ratio of free-play to organized play was associated with higher indoor sedentary behavior among boys and girls (3.9 min/day and 10.0 min/day, respectively). For every 1 acre of outdoor activity space used, an additional 2.7 min/day of moderate-to-vigorous physical activity was observed for boys. A higher free-play to organized play ratio was associated with higher outdoor moderate-to-vigorous physical activity for boys and girls (4.4 and 3.4 min/day increase, respectively). Policy characteristics were unrelated to moderate-to-vigorous physical activity levels and time spent sedentary.

Conclusion: Findings indicate that policies and size of activity space had limited influence on moderate-to-vigorous physical activity and sedentary behavior, suggesting that a programmatic structure may be a more effective option to improve moderate-to-vigorous physical activity levels of children attending afterschool programs.

Introduction

The majority of children and youth fail to meet current physical activity guidelines (Moore et al., 2014; Troiano et al., 2008), making inactivity among school-age children an important public health concern. In recent years, afterschool programs (ASPs; 3:00 pm–6:00 pm) have emerged as an opportune setting for children to accumulate up to half of their total daily recommended moderate-to-vigorous physical activity (MVPA) (Beets et al., 2010b; U.S. Department of Health and Human Services, 2008). However, the majority of children attending ASPs are failing to accumulate 30 min of MVPA (Beets et al., 2012; Beets et al., 2010a). In an effort to increase the physical activity levels of youths attending ASPs, 14 states and a number of national organizations (e.g., the National Afterschool Alliance and Boys & Girls Club) have developed and/or endorsed policies and standards aimed at creating supportive physical activity environments (Beets et al., 2010b; Wiecha et al., 2011). At their core, these policies focus on characteristics such as the amount of physical activity accumulated by the youth attending (e.g., in California, 30 min of MVPA, and in North Carolina, 20% of attendance spent in MVPA), the presence of written policies, the provision of professional training for staff on physical activity promotion, scheduling of physical activities, quality of physical activities offered, and an evaluation process (Beets et al., 2010b; Weaver et al., 2012).

* Corresponding author at: Department of Exercise Science, Arnold School of Public Health, University of South Carolina, 921 Assembly Street, 1st Floor Suite, GA 02, Columbia, SC 29201, United States.
E-mail address: ajja@email.sc.edu (R. Ajja).

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Few studies have evaluated the impact of supportive physical activity polices/standards on the activity levels of children attending ASPs. Findings from these studies indicate that policies are largely unrelated to children's physical activity levels (Beets et al., 2013a), suggesting that other ASP characteristics may be influencing children's activity levels. These include physical characteristics such as size of activity space, and contextual characteristics such as location of activity opportunities (i.e., indoor vs. outdoor), and type/structure of the activity sessions (i.e., free-play vs. organized-activities) (Baranowski et al., 1998; Hinkley et al., 2008; Vanderloo et al., 2013). To date, a limited number of studies have evaluated the association between such ASP contextual program characteristics and children's physical activity and sedentary behaviors. Findings from these studies suggest that children spend significantly more time in MVPA when engaged in outdoor free-play (Coleman et al., 2008; Rosenkranz et al., 2011). Additional examination of these associations can assist in identifying modifiable leverage points within the ASP setting that can be targeted in interventions to increase children's MVPA (Beets et al., 2013b). Therefore, the purpose of the present study is to evaluate the association of policy characteristics and other program characteristics (i.e. physical and contextual characteristics) with the MVPA and sedentary behavior of children attending a diverse range of ASPs.

Methods

Participants

Twenty diverse ASPs across South Carolina, serving over 1800 children (K to 5th grade), were recruited as part of a larger group randomized controlled trial (Beets, 2014). Baseline measurement took place during spring 2013. Programs ranged in organizational type (e.g., YMCA, Boys and Girls Club, and Parks and Recreation) and location (i.e., school-based, faith-based, or community-based). On average, program duration was 206.7 min/day, ranging from 135 to 255 min. The average percent population in poverty across the census track in which the 20 ASPs were located was 15.6 (range 4.4% to 28.8%) (U.S. Census Bureau, 2010). All procedures were approved by the Institutional Review Board at the University of South Carolina.

Physical activity measurements

Physical activity was collected via the ActiGraph GT3X+ (Shalimar, FL) accelerometer using a standardized protocol (Beets et al., 2012, Beets, 2014). In brief, accelerometers were programmed to collect activity in 5-second epochs to account for the sporadic nature and transitory pattern of children's physical activity (Bailey et al., 1995). The accelerometers were fitted around the children's waist on the right hip upon arrival to the ASP by research staff and time was recorded (time on), as well as demographic information of participating children. Research staff removed the accelerometer prior to the child's departure and recorded the time (time off). Research staff continuously monitored the entire ASP for child compliance in wearing the accelerometer. Data was collected on four unannounced non-consecutive week days (i.e., Mon–Thurs), with each child having the opportunity to wear an accelerometer for up to 4 days. A total accelerometer wear-time of $\geq$60 min was considered a valid ASP day of accelerometer data (Beets et al. 2010a; Beets et al., 2012; Trost et al., 2008). The cut-points established by Evenson and colleagues for MVPA were used to estimate physical activity intensity levels (Evenson et al., 2008). Matthews and colleagues' cut-points were used to estimate sedentary behavior (Matthews et al., 2008). Time (minutes/day) spent indoors and outdoors was determined using the GT3X+ ambient light sensor. A lux threshold of 32 was applied to accurately assess indoor and outdoor locations (ROC curve–AUC 0.93, sensitivity 92.7, and specificity 92.6). These procedures were performed throughout the duration of the study.

Policy characteristics

Each afterschool program was evaluated for the presence of 11 supportive physical activity policy characteristics/items [i.e., (1) the presence of written policy to promote physical activity, (2) child feedback, (3) screen time, (4) types of physical activities, (5) allocation of time for physical activity in the schedule, (6) the presence and (7) quality of staff training to promote physical activity, (8) providing activities that appeal to both girls and boys, (9) curriculum, (10) providing parent workshop(s) and (11) evaluation/monitoring (see Supplementary material)] using the Healthy Afterschool Program Index-Physical Activity (HAPI-PA) scale from the Healthy Afterschool Activity and Nutrition Document (HAAND) tool (Ajja et al., 2012). In the HAPI-PA, each item was scored on an ordinal scale from zero up to four. All items were summed to represent an overall total score ranging from zero to 25 with higher scores indicating more supportive policy characteristics for physical activity. All policy characteristic data were collected by two research assistants during a single day site visit that consisted of an interview with the ASP site leader, review of available documents, and direct observation of program delivery. Reliability (percentage agreement and kappa) across all items ranged from 87.5% to 100% and $\kappa = 0.73$ to 1.00.

Contextual characteristic of physical activity

For the purpose of this study, contextual characteristics refer to the type/structure of the physical activity offered at the program and was classified as either free-play or organized-activity. Free-play was defined as unplanned activity and/or that not led by staff, commonly consisting of children being released to play in an area with fixed (e.g., playground, basketball hoops) and/or portable physical activity equipment (e.g., balls, jump ropes) while supervised by staff. Organized-activity was defined as planned physical activities led by staff, and include sports, games (e.g., tag, duck–duck goose), dances, races etc. (Coleman et al., 2008; Trost et al., 2008). Activity type was evaluated via direct observation using the System for Observing Staff Promotion of Activity and Nutrition (SOSPAN) (Weaver et al., 2014). The SOSPAN is based on momentary time sampling in which continuous scans (i.e., one after another) are performed for the duration of the ASP to capture the contextual factors within pre-designated target areas. Trained research assistants conducted the observations by systematically rotating through target areas where children were present. Reliability (percentage agreement and kappa scores) for activity type (i.e., free-play vs. organized-activities) was 98.1% and 98.7% and $\kappa = 0.96$ and 0.97, respectively. Because both free-play and organized activities could occur simultaneously, for analytical purposes, a ratio of free-play to organized-activities was created, where higher numbers indicated a greater amount of free-play occurring during the physical activity opportunity (i.e., the number of scans observing free-play divided by the number of scans observing organized activity).

Physical characteristics

Based on the ASP site directors' self-report, all areas available for physical activity (e.g., gym, open green space, and courts) and non-physical activity space (e.g., classrooms and cafeteria) were identified, divided into target areas, and measured for physical size. Utilized indoor and outdoor physical activity space was verified by the program site director and direct observation via SOSPAN. Indoor physical activity area (ft^2) was measured using a measuring wheel (Keson RoadRunner). Google Earth software was used to obtain aerial imagery (top down) of the outdoor area used for physical activity. A polygon measurement tool was then used to map target area boundaries. Estimates of the outdoor spatial area (acre) were calculated using Geographical Information Systems software (GIS) (Hall, 2010; Maitland et al., 2013).

Anthropometry

Height and weight measurements were conducted with children wearing light clothing and no shoes. Height was measured to the nearest 0.1 cm, using a portable stadiometer (Charder HM 200P) and weight was measured to the nearest 0.1 lb with a high precision electronic scale (TANITA HD-314). Details of the measurement protocol are reported elsewhere (Beets et al., 2012; Beets et al., 2010a).

Statistical analysis

Descriptive means, standard deviations, and percentages (for dichotomous variables) were computed. The association between time spent being physically active and in sedentary behavior in relation to environmental and policy characteristics was evaluated using random effects mixed model regression accounting for multiple measurement days, nested within children and nested within ASP. The dependent variables in the model were the minutes spent in physical activity (MVPA)

and sedentary behavior. Independent variables included in each model were total HAPI-PA score, utilized indoor or outdoor physical activity space (based on direct observation), and the ratio of free-play to organized-play observed (defined as the proportion of free-play to organized activities with positive values indicating more free-play compared to organized-activities). Models were evaluated separately for the amount of time spent engaged in MVPA and time spent in sedentary behavior during indoor and outdoor opportunities for boys and girls. All estimates were adjusted for child-level characteristics (i.e., age, race, BMI percentile) and ASP characteristics (i.e., percent population in poverty and program duration). Additionally, the interaction between policy scores and indoor and outdoor space, as well as, the interaction between policy scores and type of physical activity (i.e., organized or free play) were evaluated in the models. Only interactions that were statistically significant ($p < .05$) were retained in the model. All analyses were conducted using Stata (v12, College Station, TX).

Results

A total of 1302 children (5–12 years old) wore accelerometers for up to 4 non-consecutive days while attending the ASPs. Table 1 presents the descriptive characteristics of children attending the ASPs, specific program characteristics, as well as physical activity outcomes. Boys and girls accumulated an average of 24.2 and 18.1 min of MVPA/day and 64.6 and 69.8 min/day of sedentary behavior, respectively. Boys accumulated 11.3 min of indoor MVPA/day (49%) and 13.4 min of outdoor MVPA/day (51%), while girls obtained 7.9 min of indoor MVPA/day (47%) and 10.7 min of outdoor MVPA/day (53%).

Model-derived estimates for the amount of time boys and girls spent in MVPA and sedentary behavior while indoors and outdoors are presented in Tables 2 and 3. The presence of physical activity supportive policy characteristics was unrelated to boys' MVPA and sedentary behavior both indoors and outdoors. For every one unit increase in HAPI-PA score, girls accumulated fewer daily minutes of indoor MVPA [−0.7 (95% CI −1.1 to −0.4) minutes/day (i.e., −42 s/day)] and more daily minutes of outdoor MVPA [0.9 (95% CI 0.0 to 1.7) minutes/day (i.e., 54 s/day)].

With each additional 5000 ft^2 of utilized indoor activity space (i.e., approximately the size of a small gymnasium with one basketball court), boys and girls spent an additional 2.4 (95% CI 0.5 to 4.4) and 3.3 (95% CI 0.9 to 5.7) min/day sedentary while indoors respectively. Girls' accumulated an additional 0.7 (95% CI 0.1–1.3) min/day (i.e., 42 s/day) of indoor MVPA. A higher free-play to organized activity ratio was associated with an additional 3.9 (95% CI 0.2 to 7.5) and 10.0 (95% CI 5.7 to 14.3) min/day of indoor sedentary behavior for boys and girls, respectively, and an additional 2.4 (95% CI 0.9 to 3.9) min/day of indoor MVPA for boys. For every additional acre of utilized outdoor activity space, an additional 2.7 (95% CI 1.2 to 4.3) min/day of outdoor MVPA was observed among boys. A higher free-play to organized activity ratio was associated with an additional 4.4 (95% CI 1.8 to 6.9) and 3.4 (95% CI 1.4 to 5.5) min/day of outdoor MVPA for boys and girls, respectively. None of the interactions met the criteria for statistical significance and therefore, not included in the final models.

Table 1
Child-level characteristics, afterschool program characteristics, physical activity and time spent in sedentary, mean (SD) unless otherwise noted.

	Overall	
Child-level characteristics		
Age (year)	7.9 (1.8)	
Gender (%)		
Boys	53.6	
Girls	46.4	
Race (%)		
White	56.1	
Non-White	43.9	
BMI z-score[a]	0.7 (1.0)	
Afterschool program characteristics		
Percent population poverty	15.6 (6.6)	
Program duration (minutes)	206.7 (27.5)	
HAPI-PA[b]	9.1 (2.9)	
Indoor used activity space (5000 ft^2)	1.0 (1.3)	
Outdoor used activity space (acre)	0.9 (1.0)	
Physical activity level characteristics	**Boys**	**Girls**
Average time in attendance (minutes/day)[c]	130.1 (40.3)	131.4 (39.7)
Total physical activity (minutes/day)[d]	34.7 (26.0)	31.2 (23.1)
Sedentary (minutes/day)		
Total sedentary	64.6 (25.7)	69.8 (27.4)
Total sedentary indoor	53.3 (25.3)	53.0 (28.2)
Total sedentary outdoor	12.0 (12.0)	16.9 (15.3)
Moderate-to-vigorous physical activity (minutes/day)		
Total MVPA	24.2 (14.4)	18.1 (11.1)
Total MVPA indoor	11.3 (11.3)	7.9 (7.5)
Total MVPA outdoor	13.4 (12.4)	10.7 (9.6)

Note: Not all ASPs provided outdoor physical activity opportunities resulting in discrepancies between the total mean activity and the sum of total mean indoor and total mean outdoor activity accumulated.
Study location/time: South Carolina/spring 2013.
[a] BMI represents body mass index.
[b] HAPI-PA represents total score of the Healthy Afterschool Program Index-Physical Activity.
[c] Time in attendance represents the total amount of time children wore the accelerometers.
[d] Total physical activity represents light-to-vigorous physical activity. All physical activity estimates are adjusted for total time in attendance.

Discussion

The findings from this study suggest that ASP policies were not associated with MVPA or time spent sedentary. Furthermore, the space utilized for physical activity opportunities had minimal impact on the activity levels of children attending ASPs. In contrast, modifiable programmatic features, such as the type/structure of activity provided were associated with relatively more/less time spent in MVPA and sedentary. These findings pinpoint areas of additional focus and potential modification that may assist ASPs in improving children's activity levels.

Numerous physical activity policies for ASPs have been widely endorsed by national organizations (Beets et al., 2010b; Wiecha et al., 2011). The overall intent of these policies is to facilitate active environments that should lead to higher levels of physical activity. The findings in this study suggest that policy characteristics, as currently enacted in ASPs, are unrelated to either MVPA or time spent sedentary in this setting. The reasons for this are unclear. The majority of ASPs in this study were not currently receiving professional development training. Those that did offer training provided less than 1 h of physical activity promotion instruction to their staff each year. Training is considered a cornerstone of providing high quality physical activity opportunities for children (Beets et al., 2014; Beets et al., 2013b; Weaver et al., 2012). Additionally, the current policies recommend that ASPs should provide up to 8 h of physical activity-related training each year (Wiecha et al., 2011), well above the amount reported by the ASPs in this study. Of concern was the low overall score on the HAPI-PA scale, indicating that the observed ASPs paid limited attention to any of the physical activity facilitating policy elements (e.g., monitoring, curricula adoption, child feedback) called for in existing national and state physical activity policy documents (Beets et al., 2010b; Wiecha et al., 2011). This is consistent with recent studies evaluating the adoption of physical activity policies nationally (Wiecha & Hall, 2014) and suggests that dissemination and uptake of policy in ASPs have not been accomplished. Currently in South Carolina there is no state-mandated physical activity policy for the ASP setting which could explain, in part, the low score on the HAPI-PA scale. The absence of state-mandated policy may translate

Table 2
Association of afterschool program environment and policy characteristics on boys and girls time spent in indoor moderate-to-vigorous physical activity and sedentary.

	Boys						Girls					
	Sedentary[a]			Moderate-to-vigorous[b]			Sedentary[a]			Moderate-to-vigorous[b]		
	Coef.	Std. err.	(95% CI)	Coef.	Std. err.	(95% CI)	Coef.	Std. err.	(95% CI)	Coef	Std. err.	(95% CI)
Age (years)	0.9	0.5	(−0.1–1.9)	**−0.5**	**0.2**	**(−1.0–0.0)**	**2.1**	**0.6**	**(0.9–3.2)**	**−1.0**	**0.2**	**(−1.4–0.7)**
Race (referent = White)												
Others	1.6	2.0	(−2.3–5.4)	**−2.8**	**0.9**	**(−4.6–1.0)**	**4.6**	**2.1**	**(0.6–8.7)**	**−1.9**	**0.7**	**(−3.2–0.5)**
BMI z-score[c]	0.5	0.8	(−1.1–2.2)	0.3	0.4	(−0.5–1.1)	1.2	0.9	(−0.7–3.0)	0.2	0.3	(−0.4–0.8)
Percent population in poverty	−0.3	0.4	(−1.0–0.5)	−0.1	0.2	(−0.6–0.3)	0.2	0.5	(−0.7–1.2)	−0.1	0.1	(−0.3–0.0)
Total HAPI-PA scores[d]	−1.2	0.9	(−3.0–0.6)	−0.3	0.5	(−1.3–0.6)	−0.5	1.2	(−2.8–1.8)	**−0.7**	**0.2**	**(−1.1–0.4)**
Used physical activity indoor space (5000 ft^2)	**2.4**	**1.0**	**(0.5–4.4)**	−0.6	0.4	(−1.4–0.3)	**3.3**	**1.2**	**(0.9–5.7)**	**0.7**	**0.3**	**(0.1–1.3)**
Activity type ratio[e]	**3.9**	**1.9**	**(0.2–7.5)**	**2.4**	**0.8**	**(0.9–3.9)**	**10.0**	**2.2**	**(5.7–14.3)**	0.4	0.6	(−0.7–1.6)

Note: Bolded values are significant at $p < 0.05$.
Study location/time: South Carolina/spring 2013.
[a] Time spent in sedentary time estimated via accelerometry using Matthews cut points.
[b] Time spent in moderate-to-vigorous activity estimated using Evenson cut points.
[c] BMI represents body mass index.
[d] HAPI-PA represents total score of the Healthy Afterschool Program Index-Physical Activity.
[e] Activity type ratio variable represents the proportion of free-play to organized activities with positive values indicating more free-play compared to organized activities.

to lack of accountability for ASPs in meeting nationally established physical activity guidelines.

Of note, two of the largest ASP providers in the nation, the National Recreation and Park Association and the Boys and Girls Clubs of America, have recently joined the Y of USA in adopting the National Afterschool Association's Healthy Eating and Physical Activity (HEPA) Standards (The White House Office of the First Lady, 2014). These national efforts are likely to help catalyze the recognition and adoption of policies in ASPs, which in turn, may assist ASPs in creating physical activity-friendly environments. However, while the presence of supportive physical activity policy is important, the adoption of such policies does not often translate into practice (Beets et al., 2013a). Thompson et al. (2013) evaluated compliance with policy mandates calling for providing scheduled physical education (PE) during the school day at elementary, middle and high schools in California and reported regular lack of adherence to PE schedules by teachers, in addition to discrepancies between self-reported and objectively-reported PE time. In light of these results, the development and adoption of supportive physical activity policies may not translate to changes in practice. Hence, future efforts should move beyond the development and institutionalization of ASP physical activity policies and focus on the development of effective strategies to increase implementation and compliance with established policy mandates.

Consistent with previous studies (Boldemann et al., 2006; Cardon et al., 2008; Dowda et al., 2009), the size of outdoor play space was associated with children's physical activity and sedentary behaviors. Our models showed that boys accumulated more MVPA when more outdoor space was utilized. However, the magnitude of association was relatively small in proportion to the increase in the size of outdoor play space (i.e. for boys an additional 2.7 min/day of MVPA for each additional acre used). This association did not hold true for girls. Based on model estimates, ASPs would need to use approximately 6.8 acres of outdoor activity space in order for attending children to meet California's physical activity policy that calls for children to be engaged in 30 min of MVPA while attending ASP (Beets et al., 2010b). Conversely, the size of indoor play space was associated with children accumulating more sedentary time during the ASP. This could be due to the widely observed use of physical activity space for other non-physical activity programming such as enrichment activities and homework in this sample. The limited association observed suggests that what's important is not the size of the space ASPs have, but how the space is utilized. This finding is crucial for ASPs with limited space, which struggles to meet physical activity goals outlined in existing policies.

Evidence indicates that outdoor free-play is associated with children accumulating higher amounts of physical activity (Coleman et al., 2008; Trost et al., 2008; Vanderloo et al., 2013). Findings from the present study reinforce previous literature, with outdoor free-play resulting in children accumulating more minutes of outdoor MVPA with boys accumulating more MVPA during outdoor free-play compared to girls. However, calling for more outdoor free-play opportunities may not be the most practical or feasible course of action to increase children's physical

Table 3
Association of afterschool program environment and policy characteristics on boys and girls time spent in outdoor moderate-to-vigorous physical activity and sedentary.

	Boys						Girls					
	Sedentary[a]			Moderate-to-vigorous[b]			Sedentary[a]			Moderate-to-vigorous[b]		
	Coef.	Std. err.	(95% CI)	Coef.	Std. err.	(95% CI)	Coef.	Std. err.	(95% CI)	Coef	Std. err.	(95% CI)
Age (years)	0.3	0.2	(−0.1–0.8)	0.4	0.2	(−0.1–0.8)	**1.0**	**0.4**	**(0.3–1.7)**	1.0	0.2	(−0.3–0.5)
Race (referent = White)												
Others	**2.6**	**0.9**	**(0.8–4.4)**	0.2	0.9	(−1.6–2.0)	−0.2	1.4	(−2.9–2.5)	−1.4	0.8	(−3.0–0.3)
BMI z-score[c]	−0.1	0.1	(−0.3–0.1)	**−0.2**	**0.1**	**(−0.4–0.0)**	−0.2	0.2	(−0.5–0.1)	−0.2	0.1	(−0.4–0.0)
Percent population in poverty	**0.4**	**0.2**	**(0.0–0.7)**	−0.0	0.3	(−0.5–0.5)	0.1	0.2	(−0.3–0.6)	0.1	0.2	(−0.3–0.5)
Total HAPI-PA scores[d]	0.3	0.4	(−0.5–1.0)	0.8	0.6	(−0.4–1.9)	0.3	0.5	(−0.7–1.3)	**0.9**	**0.4**	**(0.0–1.7)**
Used physical activity outdoor space (acre)	1.00	0.8	(−0.4–2.5)	**2.7**	**0.8**	**(1.2–4.3)**	1.7	1.2	(−0.6–4.0)	1.2	0.6	(−0.0–2.4)
Activity type ratio[e]	1.5	1.2	(−0.8–3.9)	**4.4**	**1.3**	**(1.8–6.9)**	0.5	1.9	(−3.2–4.2)	**3.4**	**1.0**	**(1.4–5.5)**

Note: Bolded values are significant at $p < 0.05$.
Study location/time: South Carolina/spring 2013.
[a] Time spent in sedentary time estimated via accelerometry using Matthews cut points.
[b] Time spent in moderate-to-vigorous activity estimated using Evenson cut points.
[c] BMI represents body mass index.
[d] HAPI-PA represents total sore of the Healthy Afterschool Program Index-Physical Activity.
[e] Activity type ratio variable represents the proportion of free-play to organized activities with positive values indicating more free-play compared to organized activities.

activity levels. Free-play relies on children to self-select to be active. In this scenario, children who want to be physically active are active, while other children will consistently self-select not to be physically active. Furthermore, studies indicate that under free-play conditions, physical activity levels decline quickly within the first 10 min (McKenzie et al., 1997; Pate et al., 2013; Vanderloo et al., 2013).

An interesting finding of the present study is that, although indoor free-play was associated with boys accumulating more MVPA/day, indoor free-play was also associated with boys and girls accumulating more indoor sedentary time, with girls accumulating more sedentary time compared to boys. This is likely due to the self-selection of children into non-active activities during this time. In this study, children were observed to select sedentary activities, such as sitting and talking with friends, during indoor physical activity time. This was largely attributed to the lack of structured physical activity provided during indoor opportunities. In addition, one of the potential reasons for the lack of observed association between organized physical activities and MVPA levels could be due to the type/structure of organized physical activities offered in these programs. Traditional activities/games, such as tag and kickball, included children standing and waiting for their turn and/or children being eliminated from games. This translates into children spending more time in sedentary behavior when playing these games (Foster et al., 2010; Trost et al., 2008). Thus, while free-play can be part of activity offerings, providing high quality structured activities will assist all children to meet physical activity recommendations.

Emerging literature suggests that children accumulate greater amounts of MVPA in the ASP setting when simple modifications to traditional organized games (e.g., removing lines, eliminating elimination, and reducing team sizes) are implemented (Beets et al., 2014; Weaver et al., 2013). Additionally, ASPs should consider limiting children's opportunities to engage in sedentary behaviors during designated indoor physical activity time. For instance, program leaders can schedule two or more physical activities simultaneously to allow for choice, but should not allow the choice to be inactive. Incorporating scheduling techniques such as this into ASPs is a viable strategy to reduce the amount of time children spend sedentary while indoors.

A major strength of this study was the use of objective measurement tools (accelerometers) to assess physical activity levels among a diverse sample of ASPs serving over 1800 participants across the state of South Carolina. This study also used direct observation to examine contextual information regarding the type of activity provided and evaluated accumulated activity both indoor and outdoor. A major limitation of this study includes defining physical environment in terms of the size of utilized activity space only. Studies have reported that other physical attributes of activity space such as playground design, types of activity space (courts, open space, fields, etc.), as well as the quality and quantity of play equipment could impact children's activity levels (Cardon et al., 2008; McKenzie et al., 1997). However, due to the resource limitation of this study, we were unable to incorporate these physical attribute measures of the play space into the current analysis. Future research should examine the influence physical attributes of the activity space have on children's physical activity levels in addition to the environmental variables examined in the present study. Furthermore, geographical location (rural vs. urban vs. suburban) and organizational affiliations (faith-based, The Y of USA, Boys & Girls Club, in-depended owned programs etc.,) may have an impact on children physic activity levels, however, due to limited variability in this sample, these program attributes were not assessed. Ultimately, additional research looking into those attributes is needed to further understand the role ASP physical environments play in children's physical activity levels.

Recommendation

To address the gap between ASP physical activity policies and practice and to promote adherence to policy guidelines, the following recommendations should be considered:

1) A greater emphasis should be placed on quality ASP staff training for physical activity to ensure that staff can competently carry out policy recommendations, which is critical for policy success as these individuals are often responsible for carrying out adopted policies.
2) In order to evaluate current program adherence to policies and monitor progress, ongoing evaluations of children's physical activity levels during ASP must be endorsed as part of program quality assessment. The importance of evaluating and monitoring program practices cannot be overstated.
3) Finally, in order to increase ASP accountability for meeting physical activity policy goals, ASP quality evaluation and licensing must incorporate physical activity metrics as part of its assessment and standards.

Conclusion

In summary, physical activity policies are important. However, in the absence of supportive strategies aimed at increasing policy implementation and adherence, policies are unlikely to be translated into practice in the ASP setting which will result in minimal influence on children's activity levels. Together, these findings indicate that programmatic structure, aimed at creating physical activity-friendly environments, may be more influential in increasing MVPA levels of children attending ASPs than calling for more supportive physical activity policies or more outdoor activity space.

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Conflict of interest statement

The authors declare that there are no conflicts of interest.

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