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Reach and Implementation of Physical Activity Breaks and Active Lessons in Elementary School Classrooms

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Abstract

The integration of physical activity into elementary school classrooms, through brief activity breaks (ABs) and lessons that incorporate movement into instruction as active lessons (ALs), are key parts of school physical activity programming and can improve children's health and academic outcomes. With nationally representative survey data from 640 public elementary schools in the United States, we examined the use of these practices and the extent of implementation within classrooms. ALs were used in 71.7% of schools, and ABs were used in 75.6% of schools. In multivariate models, ALs were significantly less likely to be used in majority-Latino schools (adjusted odds ratio = 0.48, 95% confidence interval [0.25, 0.93], $p < .05$) than in predominantly White schools. ABs were significantly less likely to be used in lower socioeconomic schools (adjusted odds ratio = 0.57, 95% confidence interval [0.34, 0.95], $p < .05$) than in higher socioeconomic schools. At schools where ABs were ever used, they were used by 45.6% of teachers, but fewer teachers used them at larger schools ($\beta = -.08$, $p < .01$) and at lower socioeconomic schools ($\beta = -.09$, $p < .05$). The reach of ALs and ABs is modest and classroom-level implementation is quite low. Additional dissemination and support is warranted to improve the reach and implementation of these strategies in elementary schools. Such efforts could improve the school-day experience in ways that benefit millions of young children.

Keywords

child health, dissemination and implementation, health behavior, physical activity/exercise, school health instruction

The integration of physical activity (PA) into the school day is a key aspect of the movement toward "comprehensive school physical activity programs" that is occurring in education settings (Centers for Disease Control and Prevention [CDC], 2013). However, competing demands for time during the school day and a focus on maximizing students' academic outcomes have made increasing the allocation of time for PA opportunities challenging. One promising strategy for increasing PA is for teachers in elementary school classrooms to provide brief bouts of PA within the classroom. With these approaches, the classroom teacher either pauses instruction to take a brief activity break (AB) or delivers instruction in a manner that incorporates movement directly into the lessons, which can be described as "active lessons" (ALs).

The use of brief ABs during the school day has a long history, with programs such as *Take 10!* (www.take10.net) having been disseminated and studied for more than a decade (Kibbe et al., 2011; Peregrin, 2001). The integration of PA directly into lessons, through ALs and specially designed active curricula such as Physical Activity and Academic Achievement across the Curriculum (Donnelly et al., 2013), is a newer strategy, and a recent systematic review of such interventions demonstrates their educational benefits (Norris, Shelton, Dunsmuir, Duke-Williams, & Stamakis, 2015). ABs and ALs both have important benefits such as increasing children's PA during the school day (Bartholomew & Jowers, 2011; Donnelly & Lambourne, 2011) and improving proximal academic outcomes such as attention and time on task (Mahar, 2011) and longer-term academic outcomes such as grades and scores on standardized achievement tests (Donnelly & Lambourne, 2011; Kibbe et al., 2011).

Many teachers report that they like ABs and ALs, but adoption and use of these strategies is limited (Gibson et al., 2008). Nationwide data from 2014 (CDC, 2015) found that at 43.3% elementary schools, students "participate in regular PA breaks outside of physical education, during the school day." However, no data were gathered on ALs. Although nationally representative data indicate the percentages of

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schools at which ABs are ever used—which might be characterized as "reach"—no data are available regarding how many classroom teachers at each school use such strategies—which might be characterized as an indication of "extent of implementation."

We used data from a nationally representative survey of school administrators to examine the use of ABs and ALs in elementary schools in the United States. Because prior nationally representative data sets have demonstrated that elementary school PA opportunities such as recess are less common at lower socioeconomic status (SES) schools (Slater, Nicholson, Chriqui, Turner, & Chaloupka, 2012) and that lower PA levels among Latino and Black adolescent girls as compared with non-Latino White girls are largely due to their school environments (Richmond, Hayward, Gahagan, Field, & Heisler, 2006), our analyses considered potential differences by school SES and race/ethnic composition.

Method

Source of Data

We gathered data with mail-back surveys in a nationally representative sample of public elementary schools in the United States during the 2013-2014 school year.

Procedures

The sampling frame was developed based on publicly available data sets maintained by the National Center for Education Statistics (NCES; 2015) and used a stratified simple random sampling technique, with schools selected within districts. Beginning in January 2014, we mailed surveys to the principal at 1,045 elementary schools. We offered respondents $100 for completing the 20-page survey, which addressed nutrition, PA, and wellness-related practices. We used reminder letters, emails, and phone calls to encourage responses until the end of July 2014, when the survey period closed. Surveys were returned by 640 schools (response rate = 61.2%). Analytic weights allow for inference to schools nationwide, and weights were calibrated to adjust for potential nonresponse bias. Additional details are available elsewhere (Turner, Sandoval, & Chaloupka, 2015).

Measures

Five items from part of the survey pertaining to physical education and PA were used in these analyses. ALs were assessed with one item: "Do any classroom teachers at your school provide active learning opportunities by incorporating physical activity into existing lessons (e.g., having children spell words by jumping on a mat with letters, counting while doing jumping jacks, etc.)" with response options of yes, no, and don't know. A separate set of items addressed ABs. The lead-in asked: "Some classroom teachers offer brief breaks during the school day (other than PE and recess time) for movement or brief bursts of physical activity in the classroom (e.g., Take 10!, Energizers). Do any teachers at your school provide such activity breaks?" Response options were yes, no, and don't know. Affirmative answers were followed with three items requesting: (a) the name of the curriculum, (b) how many teachers at the school use ABs, and (c) how many minutes per week third-grade students are active in ABs, not including physical education and recess. This item was anchored to third grade to improve the precision of estimation, given that practices can vary widely among grades.

To control for contextual factors, we obtained school demographic data from public use files (NCES, 2015). These variables were used as sample descriptors (Table 1) and as covariates in multivariate regression analyses to examine demographic differences (Table 2). U.S. census region was classified as Northeast, Midwest, South, and West. Locale was classified as city, suburban, town, or rural. The total number of students was used as an indicator of school size, coded as larger (>450 students) or smaller (≤450 students). Each school's student racial/ethnic composition was coded into one of four exhaustive and exclusive categories: predominantly (≥66%) White non-Latino, majority (≥50%) Black non-Latino, majority (≥50%) Latino, and other (diverse, or majority Asian or Native American). The percentage of students eligible for free/reduced-priced lunch (FRPL) was used as a proxy for SES, coded as lower (>66% eligible), moderate (>33% to ≤66% eligible), and higher (≤33% eligible).

Because schools have varying numbers of classrooms and teachers, and our survey item asked for the number of teachers using ABs, for comparisons across schools we converted this number to a percentage. This calculation used as a denominator the total number of full-time teachers at each school, obtained from the NCES data sets. Because these counts include specialists, the resulting calculation may be an underrepresentation of the percentage of classroom teachers who use ABs.

Analyses

First, we examined responses on the outcome variables (ALs and ABs). Next, we examined the overlap between ALs and ABs. We examined bivariate associations between each of the outcomes and school demographic characteristics, and then used two multivariate regression models to examine factors associated with each outcome. For parsimony, we included only the demographic variables with a significant bivariate association with each outcome in the multivariate model. For ALs and ABs, we used logistic regression to examine whether schools with responses of "yes" differed from those with responses of "no" or "don't know." Among the subset of schools using ABs (n = 490), we calculated a multivariate linear regression model to examine factors associated with the percentage of teachers using ABs. Finally, we examined responses to the open-ended items requesting the name of AB programs used, and the minutes of PA that students received each week from ABs.

Table 1. Characteristics of Participating Schools.

Characteristic	Number (unweighted)	Percentage (weighted)
School size		
Smaller (≤450 students)	301	42.8
Larger (>450 students)	336	56.6
Socioeconomic status		
Higher (≤33% of students eligible for FRPL)	184	24.9
Middle (>33% to ≤66% of students eligible for FRPL)	247	36.2
Lower (>66% of students eligible for FRPL)	205	38.2
Locale		
Urban	144	30.8
Suburban	233	36.6
Township	82	10.3
Rural	181	22.3
Region		
Northeast	152	16.9
Midwest	175	24.0
South	209	36.0
West	104	23.2
Race/ethnicity		
Predominantly (≥66%) White non-Latino students	321	39.6
Majority (≥50%) Black non-Latino students	51	10.8
Majority (≥50%) Latino students	92	19.9
Other majority or diverse student composition	176	29.7

Note. FRPL = free/reduced-priced lunch. Regions based on census classifications: Northeast (PA, NY, NJ, CT, RI, MA, VT, NH, ME); Midwest (ND, SD, MN, WI, MI, NE, KS, IA, MO, IL, IN, OH); South (TX, OK, AR, LA, MS, AL, TN, KY, WV, DC, MD, DE, VA, NC, SC, GA, FL); and West (WA, OR, ID, MT, WY, CA, NV, UT, CO, AZ, NM). Percentages sum to 100 within category, but due to small amounts of missing data may not sum to exactly 100%.

Table 2. Results of Three Multivariate Regression Models to Predict Physical Activity Practices.

	Model 1: Use of physically active lessons			Model 2: Use of physical activity breaks			Model 3: Percentage of classroom teachers using activity breaks	
Predictor variables	OR	95% CI	Adjusted prevalence (% of schools)	OR	95% CI	Adjusted prevalence (% of schools)	β	Adjusted prevalence (% of teachers)
School size								
Smaller (≤450 students; referent)								50.0
Larger (>450 students)							−.077**	42.3
Student socioeconomic status								
Higher (≤33% FRPL; referent)	1.00		74.5	1.00		80.2		52.8
Middle (>33% to ≤66% FRPL)	1.05	0.61, 1.81	75.4	0.92	0.55, 1.55	78.9	−.101**	42.7
Lower (>66% FRPL)	0.68	0.36, 1.29	66.7	0.57*	0.34, 0.95	69.7	−.090*	43.8
Student race/ethnicity								
Predominantly (≥66%) White (referent)	1.00		76.0					
Majority (≥50%) Black	0.96	0.40, 2.28	75.2					
Majority (≥50%) Latino	0.48*	0.25, 0.93	60.7					
Other/diverse	0.83	0.48, 1.43	72.5					
Number of schools in model	636			636			439	

Note. OR = odds ratio; CI = confidence interval; FRPL = free/reduced-priced lunch. Number of schools in Models 1 and 2 reduced from total of 640 to 636 due to missing data on predictor variables (school size and FRPL) at 4 schools.
*$p < .05$. **$p < .01$.

Results

Participating schools represented a wide range of demographic characteristics (Table 1). At 71.7% of schools, administrators indicated that at least one of their school's teachers use ALs, whereas 18.1% did not know and 10.2% indicated that no teachers use ALs. The prevalence of schools at which ABs were used was higher, at 75.6%, but 13.7% did not know and 10.7% indicated that no teachers use ABs. There was considerable overlap between the two strategies, with 64.1% of schools using both ALs and ABs, 7.7% using only ALs, 11.5% using only ABs, and 16.8% using neither or reporting "don't know" to both items.

Results of the two multivariate logistic regression analyses to examine ALs and ABs are shown in Table 2. As shown in Model 1, ALs were significantly less prevalent at majority-Latino schools. In bivariate comparisons, SES was associated with use of ALs, but in the multivariate model, only race/ethnicity remained significant. In contrast, ABs did not vary by race/ethnicity in bivariate models; only SES was associated with this outcome. As shown in Model 2, ABs were significantly less common in lower-SES schools (69.7%) than higher-SES schools (80.2%). In the subset of schools at which ABs were ever used, implementation was relatively low, with respondents indicating, on average, that 45.6% of their school's teachers ever use ABs (SD = 24.8%, Mdn = 40.0%). The distribution was well-suited for use as a continuous outcome ($skew$ = .59, $kurtosis$ = 2.50), and the linear regression analysis to examine school characteristics associated with the percentage of teachers using ABs (Model 3) showed that higher percentages of teachers used ABs at smaller schools, and at higher-SES schools.

Among the schools where ABs were used, respondents were asked for the name of the program; most did not write anything, or indicated "varies." Among the 31.6% of schools where a description of the program was provided, most common were *Energizers, Take 10!*, and *Brain Gym*. Regarding the amount of time that third-grade students were active in ABs, most respondents (68.6%) estimated fewer than 50 minutes per week, 12.1% estimated 50 minutes per week, 9.8% estimated more than 50 minutes per week, and 10.3% did not answer this item. In other words, at only 21.9% of schools where ABs were ever used, did the amount of time that students are active in ABs total at least 50 minutes per week (i.e., one 10-minute break daily).

Discussion

The current study was conducted to assess the extent to which PA is integrated into the classroom in elementary schools across the United States. Our data suggest that PA in the classroom—either via ALs, ABs, or a combination of both—only occurs in about three out of four elementary schools. However, this is an optimistic estimate of the extent of these practices, not only because of the potential for desirability bias in survey responses, but because many of the schools that report the use of these practices do not have full implementation among all—or even most—of their teachers, and ABs are not used frequently enough to provide students with sufficient movement opportunities on a regular basis. As estimated by principals, on average only half of classroom teachers regularly use ABs, and the total time in ABs each week is low. This is the first nationwide inquiry into the extent to which ABs are used by elementary school teachers, and the results show much room for improvement in this element of instructional practice.

Importantly, there are notable variations in these practices that indicate crucial health equity issues. The use of ALs is significantly lower in majority-Latino schools, and ABs are less common in economically disadvantaged schools, suggesting important targets for dissemination and outreach to improve health outcomes for all children. In part, this may be due to the many other challenges that occur in disadvantaged communities (e.g., hunger, crime), and financial challenges for schools that are already underfunded. However, it costs relatively little or nothing to implement ABs, with free curricula such as *Energizers* available online (Mahar, Scales, Kenny, Collins, & Shields, 2007), and no additional staff time or scheduling accommodations are needed. The finding that ALs are lower in majority-Latino schools is of concern because these schools are also less likely to provide students with recess (Slater et al., 2012), and such disparities in school environments can affect student health outcomes (Richmond et al., 2006).

Furthermore, the extent of implementation by classroom teachers also varied by school type, with higher implementation in smaller schools. One potential explanation for this finding is that smaller schools may have greater opportunities for communication and collaboration among teachers, which facilitates the sharing of information. However, this is speculative and more work is needed to examine within-school factors associated with implementation. There was not a significant association with ABs and other characteristics related to school size, such as locale (i.e., rural schools also tend to be smaller than urban/suburban schools), so this effect seems to actually be reflective of school size rather than a spurious connection with other characteristics. Nationwide surveys in middle schools also found that ABs were less common in larger schools than smaller schools (Hood, Colabianchi, Terry-McElrath, O'Malley, & Johnston, 2014); this difference warrants further inquiry. Our use of a multivariate modeling strategy provides important information regarding combinations of school factors associated with practices and highlights potential race/ethnicity and SES disparities that impact students' PA opportunities.

Our results are subject to several limitations. Inaccuracy of knowledge among survey respondents may have contributed error. However, the principal is typically the person charged with maintaining an understanding of instructional practices among elementary school teachers. The principal is likely to know whether at least some of the teachers at his or

her school use ABs and is almost certain to know whether the curricula being used in the school integrate PA into classroom instruction. It is questionable whether principals can accurately estimate the number of minutes per week that students are active in the classroom due to ABs; anchoring this item to third grade was done to reduce variability and improve specificity in estimation. However, while this anchoring may have improved comparability across schools in this study, third-grade classes are not necessarily representative of all grades. More accurate assessment of PA would be provided by objective measurement with accelerometry, but the logistical demands of such data collection would preclude the ability to gather information nationally, from large numbers of schools with varying demographic characteristics. Finally—but perhaps most important—as we note above, surveys are vulnerable to social desirability bias; this means that if any respondents were inclined to present an inaccurately positive picture of their school practices, then the true rates of reach and implementation are even bleaker than our data suggest.

Research has shown that teachers are more successful in implementing ABs when they are provided monthly support from a facilitator, as compared with teachers who receive one-time training only (Delk, Springer, Kelder, & Grayless, 2014). School- and district-level leaders, instructional coaches, and physical education teachers can play an important role in promoting student health and academics, by supporting classroom teachers in the integration of PA into instructional practice. The overlap between ALs and ABs both being used in 64.1% of schools may be a function of a small handful of teachers who are PA "champions" and who seek a variety of strategies to incorporate PA into the classroom, including both ALs and ABs. This overlap is likely to be driven by the educational practices of a handful of teachers, but as the implementation estimates show, it tends to be the exception rather than the norm that classroom teachers are using ABs. More work is warranted to examine how professional development mechanisms already in place in school settings can be used to increase teachers' competence and comfort with such practices.

In conclusion, these nationally representative data show that reach and implementation are unacceptably low, and therefore much more work is needed to understand barriers to the implementation of ALs and ABs in elementary schools. The integration of activity into the classroom via these two strategies complements the contributions of physical education, recess, and other PA opportunities, as part of comprehensive school PA programs. Such practices provide young children with regular time to be physically active during the day, and importantly they allow students a chance to refocus and recover their attention during long blocks of instructional time. Given the growing literature showing the academic benefits of activity throughout the school day (CDC, 2010), focused efforts to improve implementation of ALs and ABs have much promise for improving educational outcomes for all children. Furthermore, providing PA opportunities during the school day has profound longer-term implications for millions of young children across the country, because schools play a crucial formative role in teaching children about the importance of staying active for a lifetime, and positive experiences before the age of 10 years may be particularly crucial in this regard (ACSM, ICSSPE, & Nike Inc., 2013). Teachers and administrators have the opportunity to be champions for young children, supporting their academic and physical outcomes now and into the future by embracing instructional practices that keep students healthy, active, and engaged.

Authors' Note

The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.

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