




RESEARCH ARTICLE

Aligning Organizational Priorities and System Policies to Support Implementation Scale-Up of a Tailored Classroom-Based Physical Activity Intervention in Low-Resource Schools*

REBECCA E. HASSON, PhD^a  ANDRIA B. EISMAN, PhD^b  AMY WASSMANN, MSW^c LEXIE R. BEEMER, MS^d  THOMAS TEMPLIN, PhD^e
LYNN MALINOFF, EdD^f RONALD ZERNICKE, PhD, DSc^g LISA RABAUT, JD^h

ABSTRACT

BACKGROUND: A mismatch between organizational priorities and system-level policies can negatively impact implementation and sustainment of classroom-based physical activity (PA) interventions. The purpose of this study was twofold: (1) present methods to systematically identify organization- and system-level implementation barriers, and (2) align organizational priorities and system policies by designing multi-level implementation strategies. This alignment will support implementation scale-up of a tailored PA intervention in one low-resource intermediate school district (ISD; 16 districts, 32 schools) in central Michigan.

METHODS: Multi-level assessments of organizational readiness were conducted using the Hexagon Discussion and Analysis Tool to assess intervention-context fit, the Wellness School Assessment Tool 3.0 to evaluate district PA policy strength and comprehensiveness, and semi-structured interviews were conducted to assess administrative support and priorities related to PA programming.

RESULTS: Our assessments revealed three implementation barriers: limited structural capacity to sustain teacher training, limited resources across districts and school buildings to support teachers, and misalignment of ISD and district PA policies and priorities.

CONCLUSIONS: Greater attention to organizational capacity and existing infrastructure should be considered *a priori* to support effective implementation and sustainment of PA interventions in low-resource schools.

Keywords: social determinants of health; child and adolescent health; school-based interventions; implementation science.

Citation: Hasson RE, Eisman AB, Wassmann A, et al. Aligning organizational priorities and system policies to support implementation scale-up of a tailored classroom-based physical activity intervention in low-resource schools. *J Sch Health*. 2023; 93: 464-474. DOI: 10.1111/josh.13321

Received on June 17, 2022

Accepted on February 12, 2023

Most children across the United States are not regularly active despite the numerous benefits known to accrue from engaging in leisure-time physical activity (PA).¹ Approximately 42% of US children ages 6 to 11 years attain recommended amounts of PA,² with PA levels declining as children move into adolescence.^{3,4} Children living in low-resource communities report even lower rates of

PA.⁵ This is due in part to fewer built and social environmental supports for PA as compared to more affluent communities. For example, children experiencing socioeconomic disadvantage are more likely to live in areas with high crime rates,^{6,7} perceive their neighborhoods as less safe,⁸ and report physical and social disorder in their neighborhoods.⁹ Children attending low-resource schools are also less likely

^aAssociate Professor, (hassonr@umich.edu), University of Michigan School of Kinesiology, Ann Arbor, MI 48109; University of Michigan Exercise & Sports Science Initiative, Ann Arbor, MI 48109.

^bAssistant Professor, (aeisman@wayne.edu), Wayne State University College of Education, Detroit, MI 48202; Wayne State Center for Health and Community Impact, Detroit, MI 48202.

^cRegional School Health Coordinator, (wassmanna@sisd.cc), Saginaw Intermediate School District, Saginaw, MI 48603.

to have recess,¹⁰ a certified physical education (PE) teacher,¹¹⁻¹³ or after-school sports programming.¹⁴ Thus, PA interventions should be strategically placed and accessible to the highest-need communities where inequalities in access to PA resources exist.

Within the United States, elementary schools serving children ages 6 to 11 years have traditionally provided many opportunities for children to be physically active using the Comprehensive School Physical Activity Program (CSPAP) framework.¹⁵ This multicomponent approach encourages schools and districts to use all opportunities (ie, before, during, and after school) for students to be physically active, meet the national recommendations of daily PA, and develop the knowledge, skills, and confidence to be physically active for a lifetime. Evidence-based classroom PA interventions, a component of the CSPAP framework, can provide an additional 20 minutes of PA per day,¹⁶ which is one-third of the US school-based recommendations.¹⁷ That exercise dose has demonstrated efficacy in improving fitness and reducing fat mass in sedentary children at a higher weight status, regardless of sex or race.¹⁸

Findings from in-class interventions implemented across the country have also demonstrated success in improving in-school PA, on-task behavior, and academic achievement—all of which are key motivators for schools to adopt these programs.¹⁹⁻²¹ In addition to PE and recess,^{16,17,22} classroom PA breaks have provided positive PA experiences in both boys and girls helping to reduce gender and asthma inequalities in PA participation.²³⁻²⁶ This is particularly relevant for girls experiencing socioeconomic disadvantage²⁷ and for children with asthma who have cardiorespiratory limitations.²⁸ Parents from both demographic groups have voiced concerns regarding their child's safety while exercising and their desire for safe spaces for girls and safe exercises for children with asthma to be physically active.^{27,28} Nationally representative data also confirm that school-level differences in PA opportunities contribute to lower PA levels, particularly among girls attending low-resource schools likely due to fewer PA supports in their communities.²⁹ As such, targeting classrooms where children spend most of their day in seated instruction^{17,30} is a feasible strategy to promote PA and reduce health inequalities in children. Existing

PA interventions, however, have not been sufficiently adapted (ie, tailoring that includes minor changes to the intervention with all components largely intact versus more substantive adaptations to form elements that leave functional core elements intact) to meet the needs of teachers.³¹ This is especially apparent in low-resource schools, resulting in low-intervention fidelity, and effectiveness.³² Because of resource constraints,³³ high teacher turnover/under-staffing,³⁴ as well as environmental barriers including a greater percentage of students on free and reduced lunch (FRL)³⁵ in low-resource schools, PA interventions implemented in these settings need to be adapted *and* tailored to achieve fidelity and public health impact.

Interrupting Prolonged sitting with ACTivity (InPACT), is an in-class PA intervention that was developed with a comprehensive set of implementation strategies to mitigate barriers unique to this context.²³ These strategies included the development of: (1) exercise training videos; (2) a printed Compendium of Physical Activities, which included 200 PA breaks; (3) classroom management procedures and posters; (4) target heart rate zone posters; and (5) a series of floor plan options to maximize floor space for PA. The core function of these strategies was to overcome universal barriers to intervention implementation including time constraints of teachers, low teacher self-efficacy, student behavior, and space constraints of classrooms. Replicating Effective Programs, a multifaceted implementation strategy was also deployed to tailor program packaging, teacher training, and technical assistance processes in low-resource schools.³⁶ The core functions of InPACT were retained to enable students to accumulate up to 20 minutes of PA per day in the classroom but adapted to meet the unique needs of the setting. This tailored approach of deploying fidelity-consistent adaptations was disseminated as a program guide³⁷ and demonstrated success in enhancing intervention-context fit, particularly among low-resource schools. A complete description of the program guide has been previously published.^{23,36}

The conceptual model that informs InPACT is the widely used socio-ecological model. This model suggests that increases in PA related to the InPACT intervention, will be the result of a complex interaction

^dGraduate Research Assistant, (abeemer@umich.edu), University of Michigan School of Kinesiology, Ann Arbor, MI 48109.

^eProfessor, (ttemplin@umich.edu), University of Michigan School of Kinesiology, Ann Arbor, MI 48109.

^fDirector, (lmalinoff@umich.edu), Eastern Michigan University, Ypsilanti, MI 48197.

^gProfessor, (zernicke@umich.edu), University of Michigan School of Kinesiology, Ann Arbor, MI 48109; University of Michigan Exercise & Sports Science Initiative, Ann Arbor, MI 48109.

^hManaging Director, (lisaraba@umich.edu), University of Michigan Exercise & Sports Science Initiative, Ann Arbor, MI 48109.

Address correspondence to: Rebecca Hasson, Associate Professor, (hassonr@umich.edu), University of Michigan School of Kinesiology, 830 North University Avenue, Ann Arbor, MI 48109.

The results of this study are presented clearly, honestly, and without fabrication, falsification, or inappropriate data manipulation. This work was supported by the Michigan Health Endowment Fund (R-2004-146,610). A. B. Eisman was supported during this project by a National Institute of Health training award (K01DA044279).

*Indicates that continuing education hours are available. Visit www.ashaweb.org and click on Continuing Education for more information.

between multiple intervention components (ie, intervention delivery and student engagement) across multiple levels (ie, classroom, school, district, and region). While individual-level factors (eg, children's enjoyment of InPACT activity breaks) may be part of the explanation for the change in PA, activity levels are likely changing primarily because of an increase in access to structured PA opportunities and organization changes. So, while teacher motivation to implement InPACT has been enhanced by reducing many classroom- and school-level implementation barriers,³⁶ it is also important to consider indicators of organizational readiness at the district and regional level that influence the implementation process.³⁸

All too often evidence-based programs are adopted with teacher training initiated immediately without any consideration of the organizational capacity and system-level policies in place to support implementation.^{32,39,40} Indeed, adoption rates of classroom-based PA interventions in elementary schools across the United States is nearly universal (92%), but few teachers achieve the recommended dose of 10 minutes of classroom activity per day.⁴¹ This points to low-intervention fidelity and a need for implementation and sustainment supports. A lack of planning can also result in a disconnect between organizational actions and priorities, which can impede intervention implementation.⁴² Finally, a mismatch between system-level policies and organizational programming can negatively impact sustainment of PA interventions.⁴³ By building the infrastructure for district-wide intervention effectiveness and sustainment *before* training and intervention delivery begins, the likelihood of implementation success can be substantially increased.⁴⁴

To date, the feasibility of InPACT has been demonstrated in 40, 3- to 5th-grade classrooms across 5 elementary schools in the state of Michigan.^{23,24} Yet, there is a need to systematically scale-up implementation to the district and region levels to provide more structured PA opportunities to low-resource schools in central Michigan. The purpose of this study was twofold: (1) present methods to systematically identify organization- and system-level implementation barriers, and (2) align organizational priorities and system policies by designing multi-level implementation strategies. This alignment will support implementation scale-up of a tailored PA intervention in one low-resource intermediate school district (ISD; 16 districts, 32 schools) in central Michigan. We focused on barriers at the organization level (ie, school) and system level (ie, district and region) to build on our prior work of enhancing InPACT intervention-context fit at the classroom level.³⁶ We also focused specifically on the pre-implementation phases that are often underdeveloped in intervention implementation efforts.⁴⁵

METHODS

Participants

One low-resource, low-active county in southeast Michigan whose needs aligned with providing more structured PA opportunities for youth was targeted for InPACT implementation planning. That county ranked 77th out of 83 counties in the state of Michigan for overall health outcomes and PA.⁴⁶ Approximately 30% of its residents reported they did not have access to gyms, parks, and sports programs, and the violent crime rates in their communities were 43% higher than in comparison to the state's average.⁴⁶ In a recent survey, county residents ranked obesity and chronic illnesses as the top priority physical health condition with over 62% of respondents listing obesity specifically.⁴⁷⁻⁴⁹ Consequently, limited PA among children and youth was identified as a significant need in this county.

Intermediate School District: Within the low-resource, low-active county, the ISD was invited to work collaboratively with university researchers to develop the InPACT implementation plan. The partnering ISD consisted of 16 school districts with 32 elementary schools. Of the 32 elementary schools, 28 schools qualified for Title I funding with over 73% of their student population eligible for FRL.⁵⁰ This ISD serves urban, suburban, and rural districts, and because of that diversity, this ISD was considered a model ISD to identify key barriers that may arise during InPACT implementation across different contexts in the state of Michigan. In collaboration with ISD stakeholders, local capacity to implement InPACT in this ISD was determined.

Planning team: The process of developing an implementation plan consisted of an interdisciplinary team that included administrators from the low-resource ISD, a regional school health coordinator, community outreach specialist, implementation scientist, and behavioral interventionists at three research universities. Regional health coordinators represent 24 coordinating sites in Michigan, which serve as hubs for delivering evidence-based programs driven by current state and local data, research, and educational requirements. The researchers on the team had extensive experience in school-based intervention development and evaluation, health equity, and PA promotion, and were from disciplines including kinesiology, public health, and education.

Exploration, Preparation, Implementation, and Sustainment Framework

The Exploration, Preparation, Implementation, and Sustainment (EPIS) framework was used to inform our pre-implementation assessments. EPIS uses a 4-phase approach to guide and describe the implementation process.⁵¹ In the Exploration phase, organizations

consider the emergent or existing health needs and work to identify the best intervention to address those needs. Stakeholders subsequently decide whether to adopt the identified intervention. In the Preparation phase, potential barriers and facilitators of implementation are identified, the need for adaptation is assessed, and a detailed implementation plan is developed. Options for additional supports (ie, implementation strategies) to address anticipated barriers are also developed in this phase. In the Implementation phase, intervention implementation is initiated along with ongoing monitoring of the implementation process. Finally, in the Sustainment phase, system and organizational structures, processes, and supports are put into place so that the intervention continues to be delivered with additional adaptations as necessary.

Study Design

The Exploration phase began with the recognition of an issue that needed attention (ie, PA levels of children and youth) and continued with stakeholder engagement to evaluate: (1) intervention-context fit at the ISD level, (2) district-wide PA policy strength and comprehensiveness, and (3) staff perceptions of administrative support and priorities for PA programming across the ISD. This evaluation was guided by determinants identified in the EPIS framework.^{51,52} We used a quasi-mixed methods approach whereby distinct research questions were addressed using these different types of data to identify organization- and system-level barriers to InPACT implementation. Quantitative data were used to assess intervention-context fit and the strength and comprehensiveness of district wellness policies. Qualitative data were used to examine staff perceptions. Following identification of key barriers, the Preparation phase included the design of implementation strategies to overcome key barriers.

Procedures and Instruments

Intervention-context fit: The Hexagon Discussion and Analysis Tool was used to assess intervention-context fit and determine whether the prerequisite conditions existed to facilitate district-wide implementation and sustained use of InPACT. These conditions included but were not limited to alignment with district needs and priorities, fit with current initiatives, capacity to implement, strength of evidence for program effectiveness, usability of program, and available supports. The tool was developed by the National Implementation Research Network (NIRN) as part of the Active Implementation Frameworks (AIFs).⁵³ The AIFs are based on the 2005 synthesis of implementation research literature and are comprised of five overarching frameworks that help guide

the implementation process. The five frameworks within the AIFs are: (1) usable innovation, (2) implementation drivers, (3) implementation teams, (4) improvement cycles, and (5) implementation stages.⁵⁴ The tool was previously used in schools when situating evidence-based mental health programs within school-wide behavioral interventions to ensure a match between student needs and the potential program.⁵⁵ It was also adapted by the Kentucky Department of Education and Head Start programs for educators and early childhood specialists to assess how new and existing programs fit into their setting.⁵⁶

District-wide PA policy strength and comprehensiveness: District wellness policies within the low-resource ISD were evaluated using the PE and PA section of the validated Wellness School Assessment Tool 3.0⁵⁷ (<https://www.wellsat.org/>). Both the comprehensiveness and strength of each district policy were evaluated. This tool had been previously used to evaluate the quality of model wellness policies in 34 states.⁵⁸

Staff perceptions of administrative support and priorities: One-on-one semi-structured interviews with school support staff (ie, PE teachers and social workers) were conducted to assess staff perceptions of administrative support and priorities related to PA programming and successful intervention implementation. These included training time and resources, administrator leadership and support, organizational culture, and climate. Interviews were conducted by trained research staff using videoconferencing. Purposive sampling was used to select participants with the criteria of participants being either a PE teacher or social worker within the ISD. All PE teachers and social workers in the ISD were contacted and provided with the opportunity to participate in the interview. Seven support staff from schools across the ISD agreed to be interviewed. Using a semi-structured interview protocol, all participants were asked the same interview questions; interviewers also asked additional unplanned questions to further assess new information introduced by participants.⁵⁹ Interviews ranged from 30 to 45 minutes in duration and were audio recorded and transcribed verbatim utilizing a transcription company.

Data Analysis

The Hexagon Tool analysis was conducted by the regional school health coordinator along with ISD staff and school administrators (ie, Director of Instructional Services, Executive Director of Instruction, Lead Nutrition Facilitator, one elementary school principal, and special education director for the school district) during the 2019 to 2020 academic year. The assessment team provided a single rating for each indicator on a 5-point Likert scale. Total scores were calculated by summing the indicator scores; higher scores indicated greater capacity to implement InPACT.

The PA policy analysis was conducted by the research team. Each PE and PA item was coded from 0 to 2. A “0” meant the item was not addressed; a “1” meant the item was addressed but with vague language; and a “2” meant the item was addressed with clear and specific language. Each policy was independently and randomly evaluated by three coders. Coders then came to a consensus for each item. Comprehensiveness was calculated by the number of PE and PA items rated as 1 or 2, divided by the total number of PE and PA items and then multiplied by 100. Strength was calculated by the number of PE and PA items rated as 2, divided by the total number of PE and PA items and then multiplied by 100. District policy scores were then compared to national averages.^{57,60}

Using a phenomenological approach, a thematic content analysis was used to analyze the data and develop themes to understand the essence of each teacher’s and social worker’s lived experience as a PE teacher and their perceptions of the school context and ability to support classroom-based PA. Qualitative data from the semi-structured interviews were analyzed using the “Rigorous and Accelerated Data Reduction” (RADaR) technique.⁶¹ Three trained research staff conducted the data analysis. Regular research meetings were held throughout the data analysis process with research team members with qualitative expertise to discuss and debrief the code book and data analysis process. To enhance trustworthiness, researcher triangulation was used by having three research team members analyze the data and then meet to discuss their individual findings ultimately coming to a collaborative consensus. That method allowed for

multiple perspectives and limited bias from occurring. In addition, the analysis team looked for answers that were outliers to understand instances when individual participant perspectives were different from the main findings.

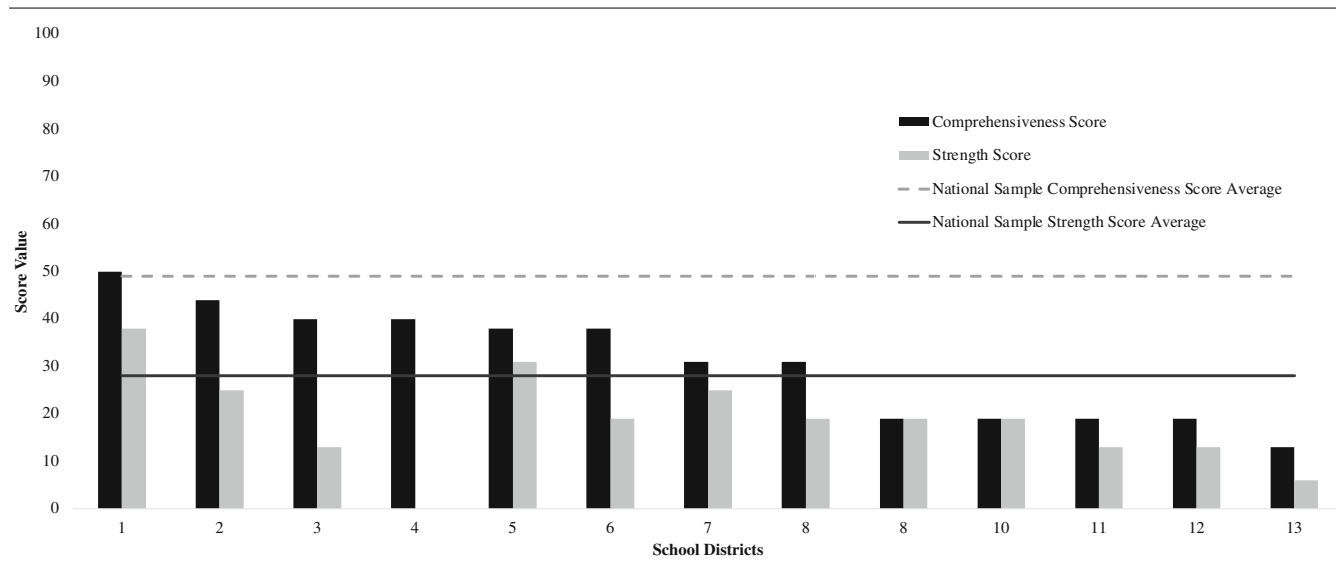
RESULTS

Intervention-context fit: The Hexagon Tool analysis conducted by the regional school health coordinator, ISD staff, and school administrators yielded a moderate intervention-context fit with an overall score of 19 out of 30. More specifically, InPACT received a *need* score of 3 out of 5; a *fit* score of 3 out of 5; a *support* score of 3 out of 5; an *evidence* score of 4 out of 5; an *usability* score of 3 out of 5; and a *capacity* score of 3 out of 5.

District-wide PA policy strength and comprehensiveness: Figure 1 displays the WellsAT 3.0 PEPA scores for each district. Of the 16 districts, 13 had a wellness policy that was publicly available on district websites. The average PE and PA score for comprehensiveness was 31 out of 100 and 19 out of 100 for strength. None of the policies in these school districts addressed classroom PA. These scores were also well below the national average PE and PA scores (comprehensiveness: 49 and strength: 28).^{57,60}

Staff perceptions of administrative support and priorities: Six PE teachers and 1 social worker (ie, 5 females and 2 males) employed in the low-resource ISD completed one-on-one semi-structured interviews. Participants were between 39 and 57 years of age (mean/SD: 46.7 ± 5.6 years) and all identified as non-Hispanic white. The social worker had been employed in her profession for 3.5 years and PE teachers had an

Figure 1. Physical Education and Physical Activity Scores for Comprehensiveness and Strength. Scores have been rounded to whole numbers



average of 20.3 ± 6.3 years of teaching experience. Participants served grades K-8. From the perspective of the PE teacher, data saturation was reached in this study for each question analyzed as repeating themes emerged from the data, and no new codes were being derived from participant responses during analysis of the last few interview transcripts. There were also no outlier responses observed. This was likely due to the similarity of experiences of PE teachers in schools across the ISD. From the social worker perspective, saturation could not be achieved since only one social worker participated in the interview, hence, her data were removed from the final analysis.

Three themes emerged from interview responses highlighting staff perceptions of the school context and their ability to support classroom-based PA: (1) PA is not a high priority in schools, (2) administrators were supportive of PA programming, and (3) school support staff are willing to support InPACT. Representative quotations are included in Table 1 to provide insight into the participants' responses. Pseudonyms are used to maintain anonymity of interviewees.

Preparation Phase

Our pre-implementation assessments revealed three implementation facilitators: the strength of evidence for InPACT, administrator support for PA programming, and school staff willingness to support InPACT implementation. Three key implementation barriers were also identified: limited structural capacity to sustain teacher training, limited resources across districts and school buildings to support teachers, and

misalignment of ISD and organizational PA policies and priorities. Following identification of key barriers, implementation strategies were then designed. Implementation strategies were informed by the School Implementation Strategies-Translating Expert Recommendations for Implementing Change Resources taxonomy.⁶² A focus was placed on systematically matching strategies to key barriers to enhance the likelihood of InPACT implementation success. Multiple strategies were designed with consideration of system-level and organization-level capacity and existing infrastructure to optimize sustainable approaches (see Figure 2).

To address *limited structural capacity to sustain (ongoing) teacher training* a training-of-trainer model was used. Our training-of-trainer programming engaged experienced trainers in coaching new trainers that were less experienced with a particular topic, skill, or training.⁶³ That strategy was aimed at building a cohort of competent instructors who could then teach the material to other individuals. Currently, regional school health coordinators are being trained in the effective implementation of InPACT. InPACT training sessions consist of a basic overview of the InPACT program and instructions on how to effectively use the InPACT program guide. By empowering the regional school health coordinator to effectively deliver online and in-person training, that model can be replicated in other ISDs across the state.

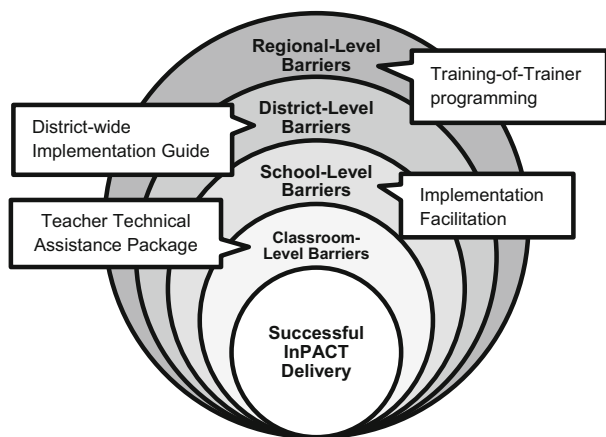
To address *limited resources across districts and school buildings to support teachers*, a district-wide implementation guide was developed to guide resource management for the effective InPACT adoption. By

Table 1. Representative Quotations of Staff Perceptions of Administrative Support and Priorities

Theme	Pseudonyms	Quote
Theme 1: PA is not a priority in schools	Molly	"It's not, you know, what I would like, but, um, I think the promotion is there, you know, I think they're very supportive, never enough for what I want them to be able to put it as a priority because, like, if they need the gym, we're the first ones to get kicked out. Like if they schedule somebody to come in for an assembly, obviously I am kicked out. And so, I'm low priority there. Bookfair, sometimes I'm low priority too."
Theme 2: Administrators supported PA programming	Tim	"I truly believe we have a lot of support, especially with our principal, to get the kids active. She does a lot of reading on activity with kids and how it's a brain booster for children. And so, we're all on the same page. So, we are trying to do all the things that we possibly can to keep them active. She goes above and beyond trying to find different things, grants, whatever, to try to get, um, more things for the kids to do."
	Christian	"They have been supportive, but on the other hand, it's like yea, he's [PE teacher] doing his [PE teacher] job. He [PE teacher] does a good job. Let him [PE teacher] go. They don't go out of their way to be crazy supportive. They check in, and they see that you're doing it and they're going, okay. Not gonna mess with ya."
	Molly	"Yep. I guess just the fact [administration] wanted us to be in-person with [students]. We haven't been cut yet. You know what I'm saying? Where a lot of schools have cut their PE teachers."
Theme 3: School support staff willingness to support InPACT	Joy	"Oh, I'm incredibly supportive, yeah, 'cause that's part of my job is to bring new things into the school and to implement those, and I want that to be, um—what's the word? —I want that—whatever I bring in I want it to be, um, continue. Continue. Sustainable. That's the word I'm looking for. Um, so I'm very—I'm very open to it [InPACT]."

PA, physical activity. InPACT, Interrupting Prolonged sitting with ACTivity.

Figure 2. The Multi-level Supports That Were Developed to Maximize InPACT Intervention Effectiveness and Implementation and Packaged into an ISD Technical Assistance Package



pooling resources (eg, equipment, personnel, and effort) administrators working in low-resource schools can maximize their assets to promote system-wide change in structured PA opportunities. The implementation guide also provided a step-by-step process on how to conduct needs assessments, policy and process evaluation, and overcome barriers related to InPACT implementation. Because the regional school health coordinator has specific expertise in supporting health-related program implementation in schools, the implementation guide also provided specific structure around assessment, evaluation and support strategies related to InPACT implementation. Finally, this guide includes key activities across all four implementation phases.⁵¹ Activities highlighted during the Exploration and Preparation phase including engaging stakeholders (Exploration) and developing intervention adaptations, logic models, and evaluation plans (Preparation). Activities highlighted in the Implementation phase included disseminating implementation plans and support tools, activating implementation teams, and tracking progress in a transparent and ongoing way. Finally, activities highlighted in the Sustainment phase include conducting a program sustainability assessment that comprise reevaluating key factors such as organizational capacity, funding stability, and partnerships.⁶⁴ The guide is publicly available on our program website (inpact.kines.umich.edu) in a downloadable format with the intended audience for this guide being school administrators, regional school health coordinators, and support staff.

To address *alignment of ISD and organizational PA policies and priorities* a continuous improvement plan was initiated to engage district stakeholders (eg, superintendent, district wellness coalition, food service director, and nutrition educators) in the process of

enhancing the strength and comprehensiveness of their PA policies using locally developed language.⁶⁵ This process included district self-evaluation, enhanced policy language, and ISD/district partner workshops. At the workshop the enhanced policy language was discussed, and feasibility of implementation was determined afterwards. Alternative strategies (eg, program integration into curriculum guides and school improvement plans) were also identified to sustain InPACT programming within the district. For a detailed description of our policy evaluation, alignment, and enhancement process, see Friday et al.⁶⁵

DISCUSSION

A lack of foundational work often contributes to failures in intervention implementation and sustainment.⁵¹ The purpose of this study was to present methods to systematically identify organization- and system-level implementation barriers, focusing on aligning organizational priorities and system policies by designing multi-level implementation strategies. This alignment will support implementation scale-up of the tailored InPACT intervention in one low-resource ISD in central Michigan. Our process was informed by the EPIS framework and highlighted the utility of implementation science frameworks to guide this work. Engaging school administrators, health coordinators, and support staff during this process served to enhance: (1) institutional support for teachers, (2) communication across different stakeholder groups, and (3) ensured all voices were heard when making implementation strategies to overcome barriers. This collaboration resulted in the development of a training-of-trainer program, an implementation guide, and continuous policy improvement planning. By utilizing the existing infrastructure of regional school health coordinators, additional resources needed across districts and school buildings were provided to support teachers. The long-term goal of this process is to create a model for effective districtwide program adoption, delivery, and sustainment. Because this work was completed before teacher training and intervention delivery begins, the likelihood of future implementation success can be substantially increased.⁴⁴

Researchers have found a robust relation between in-class PA intervention fidelity and youth outcomes. For example, the well-known Physical Activity Across the Curriculum program demonstrated schools who reported higher implementation fidelity (ie, achieved dose delivered threshold) showed greater improvements in weight status over 3 years compared to schools with low intervention fidelity. In contrast, the large-scale Texas Initiatives for Children's Activity and Nutrition intervention, which was implemented in low-resource schools, reported low fidelity (ie, <25% teachers implemented lessons daily) resulting in

lower intervention effectiveness (ie, children averaged a 3-minute increase in PA levels per day). Process evaluation indicated that while teachers strongly supported the concept, lack of planning time and available resources were identified as significant barriers to intervention fidelity.

In the present study, we intentionally focused on the pre-implementation process to collaboratively plan for implementation and sustainment success. We identified several gaps in intervention-context fit between the InPACT intervention and the ISD. For example, findings from the Hexagon Discussion and Analysis Tool suggested that many schools in the ISD were already implementing activity breaks (ie, *need* score) but without cohesive decisions around resources. Training and effectiveness data were also not available for current school-based PA programming. While InPACT did fit within existing health education programs (eg, *Whole Child*; and *Healthy Bodies, Healthy Minds*) being implemented throughout the ISD (ie, *fit* score), it was noted that InPACT trainings would need to be integrated into existing professional development to avoid costs associated with release time for teachers. While training resources were available on the InPACT program website (ie, *support* score), and there was autonomy in how the classroom strategies could be implemented. Buy-in from teachers was, however, a concern. This may have been an issue with innovation-value fit⁶⁶ (ie, teachers' perception of how well InPACT fits with the mission of the school district) or limited teacher time and capacity to implement interventions.⁶⁷⁻⁶⁹ While administrators appreciated that data were available for InPACT to increase classroom PA and student time-on-task²³ (ie, *evidence* score), there was a desire to collect additional data related to discipline, attendance, and academic improvements. The InPACT intervention was deemed usable as it had been previously implemented in diverse settings (ie, rural, urban, and suburban environments with varying socioeconomic and racial/ethnic composition), however, replication data were not available (ie, *usable* score). The InPACT intervention was offered at no cost to the school and ISD, but questions arose to the sustainability of training teachers over time (ie, *capacity* score). Finally, the PEPA policies were weak and limited in scope thereby reducing the likelihood of program sustainment. That gap in intervention-context fit and system policies underscored the need to mitigate key implementation barriers in low-resource schools to effectively target PA inequalities in these settings.

Evidence-based strategies used to scale-up successful PE programming informed the development of our implementation strategy bundle.⁷⁰ The Sports, Play, and Active Recreation for Kids program, or SPARK, identified active curricula, staff development and follow-up support as key components for effective

broad-scale dissemination, two of which (ie, staff development and support) were included in our process. Substantial collaboration among university, public schools, and private sectors has also been highlighted as an important dissemination practice.⁷¹ Our process for stakeholder engagement focused on two of these domains by strengthening university-public school relations in elementary schools in Michigan. Our work extends previous work by anchoring these evidence-based strategies into an implementation strategy bundle informed by implementation science frameworks.

IMPLICATION FOR SCHOOL HEALTH

Too often researchers have created and disseminated interventions into classroom settings and assume adoption will occur regardless of fit.^{32,39,40} In essence, single-level interventions are provided to diverse community schools with similar resources provided to increase PA, irrespective of the needs and capacity of each school to help its students achieve the recommended amount of daily PA. That lack of intervention-context fit can contribute to low intervention fidelity and effectiveness.⁵¹ The development of the current implementation strategy bundle was timely and important, because an equity-based approach was used to increase intervention fidelity and student PA participation.⁷² Equity in this case refers to adapting and tailoring interventions prior to implementation to fit the context in which the intervention will be implemented. Equity was integrated into our process by identifying unique barriers to implementation in low-resource schools and providing different types of support, at multiple levels to increase and maintain PA participation in children during the implementation phase across multiple school districts. By developing a process that simultaneously targets classroom-, school-, and district-level implementation barriers, equitable scale-up of the InPACT implementation can be an attainable goal.

Limitations

This multi-level implementation plan is not without limitations. First, organizational- and system-level implementation barriers are likely to change over time, differ by setting, and have varying appropriateness and effectiveness at different stages of implementation.⁴⁰ Second, the results of the current plan may not be generalizable to other ISDs across the state. It is important to note however, that while the data were limited to the setting and participants, the 4-phase implementation process that was used can be generalized to other ISDs to promote effective InPACT adoption, implementation, and sustainment. Finally, a validated measure of organizational readiness

was not used in this study. Rather, a pragmatic, evidence-informed tool that our partnering school districts chose was employed so that we could have comparative results with existing programs being implemented in the ISD. Further research in this area would benefit from examining the psychometric properties of the Hexagon Tool and/or utilizing other validated measures of organizational readiness.

Conclusions

Effective implementation of classroom-based PA interventions in low-resource elementary schools is critical for reducing inequalities in youth PA. The development of a theory-based multi-phase implementation process for InPACT represented a significant step in promoting equity in the implementation and sustainment of classroom-based PA interventions in low-resource schools. Valuable information was gathered on system- and organization-level barriers to InPACT implementation in one low-resource ISD in central Michigan. This information was used to design multi-level implementation strategies that proactively align organizational priorities and system policies *prior* to active implementation. As the partnering ISD moves from the preparation phase to the implementation phase, stepped-wedged, and cluster randomized controlled trials can be used to test the effectiveness of InPACT to increase total daily PA and improve child health, well-being, and achievement through classroom-based PA programming. Implementation outcomes related to InPACT intervention fidelity can also be assessed. If implementation rates continue to vary by school, information generated from effectiveness trials will inform future work of designing additional implementation strategies to increase equity in the implementation of classroom-based PA programming in low-resource schools. If implementation inequalities are eliminated, future work can focus on dissemination of the InPACT intervention.

Human Subjects Approval Statement

This study was considered Exempt Human Research by the Institutional Review Board (HUM00188402) due to the following reason: “research conducted in established or commonly accepted educational settings, involving normal educational practice, such as: (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.”

Conflict of Interest

No competing financial interests exist.

REFERENCES

1. United States Department of Health and Human Service. *Physical Activity Guidelines for Americans*. Washington, DC: United States Department of Health and Human Services; 2018.
2. National Physical Activity Plan Alliance. *The 2018 United States Report Card on Physical Activity for Children and Youth*. Washington, DC: National Physical Activity Plan Alliance; 2018.
3. Nader PR, Bradley RH, Houts RM, McRitchie SL, O'Brien M. Moderate-to-vigorous physical activity from ages 9 to 15 years. *JAMA*. 2008;300(3):295-305.
4. Troiano RP, Berrigan D, Dodd KW, Masse LC, Tilert T, McDowell M. Physical activity in the United States measured by accelerometer. *Med Sci Sports Exerc*. 2008;40(1):181-188.
5. Davison KK, Lawson C. Do attributes of the physical environment influence children's level of physical activity? *Int J Behav Nutr Phys Act*. 2006;3:1-17.
6. Cutts BB, Darby KJ, Boone CG, Brewis A. City structure, obesity, and environmental justice: an integrated analysis of physical and social barriers to walkable streets and park access. *Soc Sci Med*. 2009;69(9):1314-1322.
7. Zhu X, Haegele JA, Healy S. Movement and mental health: behavioral correlates of anxiety and depression among children of 6-17 years old in the U.S. *Ment Health Phys Act*. 2019;16:60-65.
8. Weir LA, Etelson D, Brand DA. Parents' perceptions of neighborhood safety and children's physical activity. *Prev Med*. 2006;43(3):212-217.
9. Franzini L, Taylor W, Elliott MN, et al. Neighborhood characteristics favorable to outdoor physical activity: disparities by socioeconomic and racial/ethnic composition. *Health Place*. 2010;16(2):267-274.
10. Beighle A. *Increasing Physical Activity through Recess*. San Diego, CA: Robert Wood Johnson Foundation; 2012.
11. Carlson JA, Mignano AM, Norman GJ, et al. Socioeconomic disparities in elementary school practices and children's physical activity during school. *Am J Health Promot*. 2014;28(3 Suppl):S47-S53.
12. Fernandes M, Sturm R. Facility provision in elementary schools: correlates with physical education, recess, and obesity. *Prev Med*. 2010;50(Suppl 1):S30-S35.
13. Turner L, Chaloupka F, Chiqui JF, Sandoval A. *School Policies and Practices to Improve Health and Prevent Obesity: National Elementary School Survey Results: School Years 2006-7 and 2007-2008*, Vol. 1. Chicago, IL: Institute for Health Research and Policy; 2010.
14. Young DR, Felton GM, Grieser M, et al. Policies and opportunities for physical activity in middle school environments. *J Sch Health*. 2007;77(1):41-47.
15. Centers for Disease Control and Prevention. *Increasing Physical Education and Physical Activity: A Framework for Schools*. Atlanta, GA: U.S. Department of Health and Human Services; 2019.
16. Bassett DR, Fitzhugh EC, Heath GW, et al. Estimated energy expenditures for school-based policies and active living. *Am J Prev Med*. 2013;44(2):108-113.
17. Institute of Medicine Educating the student body: taking physical activity and physical education to school, Institute of Medicine;2013.
18. Davis CL, Pollock NK, Waller JL, et al. Exercise dose and diabetes risk in overweight and obese children: a randomized controlled trial. *JAMA*. 2012;308(11):1103-1112.
19. Donnelly JE, Greene JL, Gibson CA, et al. Physical activity across the curriculum (PAAC): a randomized controlled trial to promote physical activity and diminish overweight and obesity in elementary school children. *Prev Med*. 2009;49(4):336-341.
20. Kibbe DL, Hackett J, Hurley M, et al. Ten years of TAKE 10!((R)): integrating physical activity with academic concepts in elementary school classrooms. *Prev Med*. 2011;52(Suppl 1):S43-S50.

21. Lê-Scherban F, Diez Roux AV, Li Y, Morgenstern H. Does academic achievement during childhood and adolescence benefit later health? *Ann Epidemiol*. 2014;24(5):344-355.
22. Murray R, Ramstetter C, Council on School Health, American Academy of Pediatrics. The crucial role of recess in school. *Pediatrics*. 2013;131(1):183-188.
23. Beemer LR, Ajibewa TA, O'Sullivan MP, et al. Feasibility of the InPACT intervention to enhance movement and learning in the classroom. *Transl J Am Coll Sport Med*. 2018;3(18):136-151.
24. Beemer LR, Lewis TC, Ajibewa TA, Dopp R, Eisman AB, Hasson RE. Classroom-based strategies to reduce disparities in physical activity among children with asthma. *Prev Sci*. 2022;23:587-597.
25. Pangrazi RP, Beighle A, Vehige T, Vack C. Impact of promoting lifestyle activity for youth (PLAY) on children's physical activity. *J Sch Health*. 2003;73(8):317-321.
26. Reznik M, Wylie-Rosett J, Kim M, Ozuah PO. A classroom-based physical activity intervention for urban kindergarten and first-grade students: a feasibility study. *Child Obes*. 2015;11(3):314-324.
27. Gordon-Larsen P, McMurray RG, Popkin BM. Determinants of adolescent physical activity and inactivity patterns. *Pediatrics*. 2000;105(6):E83.
28. Williams B, Hoskins G, Pow J, Neville R, Mukhopadhyay S, Coyle J. Low exercise among children with asthma: a culture of over protection? A qualitative study of experiences and beliefs. *Br J Gen Pract*. 2010;60(577):e319-e326.
29. Richmond TK, Hayward RA, Gahagan S, Field AE, Heisler M. Can school income and racial/ethnic composition explain the racial/ethnic disparity in adolescent physical activity participation? *Pediatrics*. 2006;117(6):2158-2166.
30. Rideout V, Foehr UG, Roberts DF. *Generation M2: Media in the Lives of 8-to-18 Year Olds*. Washington, DC: Kaiser Family Foundation; 2010.
31. Baumann AA, Cabassa LJ, Stirman SW. *Adaptation in Dissemination and Implementation Science*. New York: Oxford Academic; 2017.
32. Bartholomew JB, Jowers EM. Physically active academic lessons in elementary children. *Prev Med*. 2011;52(Suppl 1):S51-S54.
33. Schneider L, Chiqui J, Nicholson L, Turner L, Gourdet C, Chaloupka F. Are farm-to-school programs more common in states with farm-to-school-related laws? *J Sch Health*. 2012;82(5):210-216.
34. Blaine RE, Franckle RL, Ganter C, et al. Using school staff members to implement a childhood obesity prevention intervention in low-income school districts: the Massachusetts childhood obesity research demonstration (MA-CORD project), 2012-2014. *Prev Chronic Dis*. 2017;14:E03.
35. Crosnoe R. Low-income students and the socioeconomic composition of public high schools. *Am Sociol Rev*. 2009;74(5):709-730.
36. Hasson RE, Beemer LR, Ajibewa TA, Eisman AB. Adapting the InPACT intervention to enhance implementation fidelity and flexibility. *Prev Sci*. 2021;22:324-333.
37. Beemer LR, Eisman AB, Hasson RE, et al. *Interrupting Prolonged Sitting with Activity (InPACT) Program Guide*. Ann Arbor, MI: University of Michigan Childhood Disparities Research Laboratory; 2022.
38. Aarons GA. Measuring provider attitudes toward evidence-based practice: consideration of organizational context and individual differences. *Child Adolesc Psychiatr Clin N Am*. 2005;14(2):255-271 viii.
39. Klesges LM, Estabrooks PA, Dzawaltowski DA, Bull SS, Glasgow RE. Beginning with the application in mind: designing and planning health behavior change interventions to enhance dissemination. *Ann Behav Med*. 2005;29(Suppl):66-75.
40. Koorts H, Eakin E, Estabrooks P, Timperio A, Salmon J, Bauman A. Implementation and scale up of population physical activity interventions for clinical and community settings: the PRACTIS guide. *Int J Behav Nutr Phys Act*. 2018;15(1):51.
41. Densley B, Calvert HG, Boedeker P, Turner L. Implementation of physical activity in US elementary schools: the role of administrative support, financial resources, and champions. *Int J Environ Res Public Health*. 2021;18(9):4476.
42. Wanless SB, Patton CL, Rimm-Kaufman SE, Deutsch NL. Setting-level influences on implementation of the responsive classroom approach. *Prev Sci*. 2013;14(1):40-51.
43. Slater SJ, Nicholson L, Chiqui 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.
44. Domitrovich CE, Bradshaw CP, Poduska JM, et al. Maximizing the implementation quality of evidence-based preventive interventions in schools: A conceptual framework. *Adv Sch Ment Health Promot*. 2008;1(3):6-28.
45. Cassar S, Salmon J, Timperio A, et al. Adoption, implementation and sustainability of school-based physical activity and sedentary behaviour interventions in real-world settings: a systematic review. *Int J Behav Nutr Phys Act*. 2019;16(1):120.
46. Robert Wood Johnson Foundation. County health rankings and roadmaps: building a culture of health, county by county. <https://www.countyhealthrankings.org/app/michigan/2020/rankings/saginaw/county/outcomes/overall/snapshot>. 2020. Accessed April 22, 2018.
47. Byrd HCM, Wahl R, Lyon-Callo S, Imes G. *Physical Activity among Michigan Youth (9th-12th Grade)-2013*. Lansing, MI: Michigan Department of Health and Human Services, Lifecourse Epidemiology and Genomics Division; 2016.
48. Michigan Department of Community Health. Making a difference in obesity, Michigan's priority strategies 2014-2018: Be active, eat healthy. https://www.michigan.gov/documents/healthymichigan/A_Obesity_Strategies_2014-18_BE_ACTIVE_575671_7.pdf. 2014.
49. Saginaw County Department of Public Health. *Saginaw County Community Health Needs Assessment and Health Improvement Plan 2017-2020: An Initiative of Alignment Saginaw Community Health Improvement Plan (CHIP) Partners*. Saginaw, MI: Saginaw County Department of Public Health; 2017.
50. State of Michigan. MI School data: economically disadvantaged counts. <https://www.mischooldata.org/Other2/DataFiles/StudentCounts/HistoricalEconomicallyDisadvantagedCounts.aspx>. 2019. Accessed April 28, 2020.
51. Aarons GA, Hurlburt M, Horwitz SM. Advancing a conceptual model of evidence-based practice implementation in public service sectors. *Adm Policy Ment Health*. 2011;38(1):4-23.
52. Aarons GA, Green AE, Palinkas LA, et al. Dynamic adaptation process to implement an evidence-based child maltreatment intervention. *Implement Sci*. 2012;7:32.
53. The Hexagon: An Exploration Tool — NIRN Active Implementation Hub. Franck Porter Graham Child Development Institute. <https://nirn.fpg.unc.edu/resources/hexagon-exploration-tool>. 2019. Accessed November 10, 2022.
54. Fixsen D, Blase K, Metz A, Van Dyke M. *Implementation Science: International Encyclopedia of the Social and Behavioral Sciences*. second ed. Boston, MA: Elsevier Inc; 2015.
55. Runge TJ, Knoster TP, Moerer D, Breinich T, Palmiero J. A practical protocol for situating evidence-based mental health programs and practices within school-wide positive behavioral interventions and supports. *Adv School Mental Health Promotion*. 2017;10(2):101-112.
56. Metz A, Louison L. *The Hexagon Tool: Exploring Context*. Chapel Hill, NC: National Implementation Research Network, Frank Porter Graham Child Development Institute, University of North Carolina at Chapel Hill; 2018.
57. Schwartz MB, Piekarczyk-Porter E, Read MA, Chiqui JF. Wellness school assessment tool version 3.0: an updated quantitative

- measure of written school wellness policies. *Prev Chronic Dis.* 2020;17:E52.
58. Meendering JR, Skinner MM, McCormack LA. Model School-District wellness policies warrant improvements in comprehensiveness and strength. *J Sch Health.* 2021;91(1):77-83.
 59. Patton MQ. *Qualitative Research and Evaluation Methods.* 4th ed. St. Paul, MN: SAGE; 2014.
 60. Piekarz E, Schermbeck R, Young SK, Leider J, Ziemann M, Chriqui JF. School district wellness policies: evaluating progress and potential for improving children's health eight years after the federal mandate, School years 2006-07 through 2013-14, Chicago, IL 2016.
 61. Watkins DC, Giola D. *Mixed Methods Research in Social Work.* New York, NY: Oxford University Press; 2017.
 62. Cook CR, Lyon AR, Locke J, Waltz T, Powell BJ. Adapting a compilation of implementation strategies to advance school-based implementation research and practice. *Prev Sci.* 2019;20(6): 914-935.
 63. Centers for Disease Control and Prevention. Understanding the Training of Trainers Model. https://www.cdc.gov/healthyschools/tths/train_trainers_model.htm. 2019. Accessed July 16, 2021.
 64. Luke DA, Calhoun A, Robichaux CB, Elliott MB, Moreland-Russell S. The program sustainability assessment tool: a new instrument for public health programs. *Prev Chronic Dis.* 2014;11:130184.
 65. Friday PJ, Beemer LR, Martindale D, et al. A novel policy alignment and enhancement process to improve sustainment of school-based physical activity programming. *Int J Environ Res Public Health.* 2023;20(3):1791.
 66. Turner K, Trogdon JG, Weinberger M, et al. Testing the organizational theory of innovation implementation effectiveness in a community pharmacy medication management program: a hurdle regression analysis. *Implement Sci.* 2018;13(1): 105.
 67. Herlitz L, MacIntyre H, Osborn T, Bonell C. The sustainability of public health interventions in schools: a systematic review. *Implement Sci.* 2020;15(1):4.
 68. Turner L, Calvert HG, Carlson JA. Supporting teachers' implementation of classroom-based physical activity. *Transl J ACSM.* 2019;4(17):165-172.
 69. van den Berg V, Salimi R, de Groot RHM, Jolles J, Chinapaw MJM, Singh AS. "It's a Battle... you want to do it, but how will you get it done?": Teachers' and Principals' perceptions of implementing additional physical activity in School for Academic Performance. *Int J Environ Res Public Health.* 2017;14(10):1160.
 70. McKenzie TL, Sallis JF, Rosengard P. Beyond the stucco tower: design, development, and dissemination of the SPARK physical education programs. *Quest.* 2009;61:114-127.
 71. McKenzie TL, Sallis JF, Rosengard P, Ballard K. The SPARK programs: A public health model of physical education research and dissemination. *Jo Teaching Phys Educ.* 2016;35:381-389.
 72. Hasson RE. Addressing racial/ethnic differences in age-related declines in physical activity during adolescence. *J Adolesc Health.* 2017;61(5):539-540.