Closing the Gap Between Classroom-Based Physical Activity Intervention Adoption and Fidelity in Low-Resource Schools

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The adoption of classroom-based physical activity interventions in elementary schools is nearly universal (92%), but fewer than 22% of teachers who implement activity breaks achieve a dose of 10 min/day. Dissemination and implementation science frameworks provide a systematic approach to identifying and overcoming barriers likely to impede successful adoption and fidelity of evidence-based interventions. This review highlights the development and subsequent tailoring of a classroom-based physical activity intervention, Interrupting Prolonged sitting with ACTivity (InPACT), for delivery in low-resource schools using implementation science frameworks focused on equity. Unlike most classroom physical activity interventions, tailored InPACT includes a suite of implementation strategies (methods or techniques that support adoption, implementation, and sustainment of a program or practice) and, thus, has been designed for dissemination. These strategies were focused on increasing teacher self-efficacy and reducing multilevel implementation barriers in low-resource schools to promote intervention fidelity, effectiveness, and sustainment.

Keywords: implementation science, school-based intervention, children and adolescents, equity, health disparities

Today, less than half (42%) of children 6–11 years of age participate in the recommended 60 min of daily physical activity (PA; Troiano et al., 2008). This percentage declines as children transition into adolescence, with participation in daily moderate to vigorous PA (MVPA) decreasing by 38 min/year from ages 9 to 15 years (Merlo et al., 2020; Nader et al., 2008). Children living in low-resource communities report even lower rates of PA (Davidson et al., 2013; Richmond et al., 2006), placing them at increased risk for obesity, anxiety, depression, missed school days, and lower academic achievement (Grissom, 2005; Piercy et al., 2018; Substance Abuse and Mental Health Services Administration, 2018; Zhu et al., 2019). The recent COVID-19 pandemic exacerbated these disparities (Hasson et al., 2021) and contributed to a 17 min decline in children’s daily MVPA (Neville et al., 2022), a 9% increase in obesity (Wooldford et al., 2021), a 24% increase in child mental health crises (Leeb et al., 2020), and a widening of the preexisting achievement gap (Bailey et al., 2021). As we begin to emerge from the pandemic, we have an urgent and unmet need to increase structured PA opportunities to improve child health, well-being, and achievement. Not meeting this need will have significant consequences and costs (Carlson et al., 2015; Ding et al., 2016), including poor physical and emotional health during adolescence (Biddle & Asare, 2011; Hong et al., 2016; Paluksha & Schwenk, 2000; Tremblay & Willms, 2003) and premature morbidity and mortality in adulthood (Lee et al., 2012).

Schools are playing an important role in combating this major public health concern by integrating PA within general education classrooms during class time (Institute of Medicine, 2013). Classroom-based PA interventions are built around teacher-implemented classroom physical activities that can last from 5 to 15 min (Centers for Disease Control and Prevention, 2018). Activities can be done all at one time or several times throughout the school day. Teachers can incorporate PA into their planned academic lessons or provide short breaks from seated instruction. This approach enables schools to universally increase child PA throughout the school day (Daly-Smith et al., 2018; Densley et al., 2021; Masini et al., 2020). Other PA opportunities can be more resource dependent (e.g., sports programming), making them less accessible to low-resource schools (Hoff & Mitchell, 2007; Zdroik & Veliz, 2016). Indeed, low-resource schools are less likely to have structured recess (Beighle, 2012), a certified physical education teacher (Carlson et al., 2014; Disparities, 2007; Fernandes & Sturm, 2010; Turner et al., 2010), or after-school sports programming (Young et al., 2007) compared with high-resource schools. Nationally representative data confirm that these school-level differences in PA opportunities contribute to lower PA levels among girls attending low-resource schools (Richmond et al., 2006). Accordingly, targeting classrooms is a feasible strategy to promote PA and reduce inequities in structured PA opportunities in low-resource schools.

A growing body of literature now confirms that evidence-based classroom PA interventions implemented in elementary school settings significantly increase PA levels (Bassett et al., 2013; Masini et al., 2020) and improve weight status (Donnelly et al., 2009), on-task behavior (Daly-Smith et al., 2018), and academic achievement (Norris et al., 2020)—all of which are key motivators for schools to adopt these programs (Densley et al., 2021). Previous research also suggests that classroom activity breaks provide positive PA experiences for boys, girls, and children with asthma, helping to reduce gender and asthma disparities in PA participation (Beemer et al., 2018, 2022). Consistent with these findings, adoption rates (the intention, initial decision, or action to try or employ an innovation or evidence-based practice; Proctor et al., 2011) of classroom-based PA interventions across the United States are nearly universal in elementary schools (92%; Densley et al., 2021). This represents a 16% increase since 2013.
(Turner & Chaloupka, 2017) and a 112% increase since 2007 (Services, 2014). Yet, intervention penetration (the integration of a practice within a service setting and its subsystems; Proctor et al., 2011) is low, with less than 50% of teachers using activity breaks regularly and only 22% of those who use them achieving the minimum recommended dose of 10 min/day (Densley et al., 2021). This represents a significant gap in intervention adoption and penetration, and closing it will require more focused attention on intervention fidelity (the extent to which an intervention is delivered as intended; Proctor et al., 2011).

Our findings (Beemer et al., 2018) and those of others (Bartholomew & Jowers, 2011; Carlson et al., 2014; Weaver et al., 2018) suggest that students being served by low-resource schools, who are at greatest need of the benefits of classroom-based PA interventions, may be the least likely to receive those interventions as intended. This is due, in part, to multilevel barriers to implementation. Lack of time and low self-efficacy at the teacher level, student behavior and lack of space at the classroom level, and a poor implementation climate, competing priorities, and lack of administrative support at the school level are barriers universally experienced by all schools (Carlson et al., 2017; Turner et al., 2019; van den Berg et al., 2017; Webster et al., 2017; Figure 1). Low-resource schools, however, report additional district- and region-level barriers to successful classroom PA implementation, including resource constraints (Schneider et al., 2012) and teacher turnover/understaffing (Blaine et al., 2017) as well as environmental barriers including percentage of students on free and reduced lunch (FRL; Crosnoe, 2009). Accordingly, decision makers in low-resource schools are reluctant to invest in ongoing PA intervention implementation without knowing the return on investment in terms of improved student behavior, achievement, and instruction time gained (Acosta et al., 2021). Hence, there is a pressing need to tailor interventions and demonstrate return on investment to equitably advance intervention fidelity in low-resource schools.

Without tailored approaches, classroom-based PA interventions are likely to have little or no impact and possibly even increase health inequities for some groups (e.g., low-income populations) who are less likely to be reached or reached effectively (Beemer et al., 2018; Hasson, 2017). As the COVID-19 pandemic has demonstrated, children experiencing socioeconomic disadvantage reported the largest decline in PA and were most likely to experience negative health consequences (Dunton et al., 2020; Hasson et al., 2021). Thus, it is vital to understand how to improve intervention implementation efforts to better recognize specific gaps that may contribute to inequities. Health equity is a central indicator of success for PA intervention research, but increasing the potential to benefit all children requires a greater focus on diverse study samples and implementation settings (Hasson, 2018; Hasson et al., 2017).

A large reduction in youth PA disparities is achievable if tailored in-class PA interventions delivered by existing personnel (teachers) are more widely delivered with fidelity and implemented into practice in low-resource schools. Implementation science frameworks provide a systematic approach to tailoring interventions to community needs by identifying and overcoming barriers likely to impede successful adoption and use by existing community providers (Bauer et al., 2015). This review will highlight the development and subsequent tailoring of a classroom-based PA intervention, Interrupting Prolonged sitting with ACTivity (InPACT), for delivery in low-resource schools using implementation science frameworks focused on equity.

**Application of a Determinants Framework to Assess Implementation Barriers**

The consolidated framework for implementation research (CFIR) is a conceptual framework that was developed to guide systematic assessment of multilevel implementation contexts to identify factors that influence intervention implementation and effectiveness (Damschroder et al., 2009). CFIR focuses on constructs across multilevel domains (intervention, context [inner and outer setting], individuals, and implementation process), and the domains we highlight are especially relevant for school-based implementation (Lyon & Bruns, 2019). CFIR has also been found to be helpful in...
identifying implementation barriers in low-income contexts (Rubin Means et al., 2020). We used CFIR to systematically categorize implementation barriers that may impede health equity, which informed multilevel implementation strategies that were designed to mitigate specific barriers.

**Developing and Testing Implementation Strategies to Increase Intervention Fidelity**

Implementation strategies are methods or techniques that support adoption, implementation, and sustainment of a program or practice (Proctor et al., 2013). These strategies can be categorized as discrete, multifaceted, or blended. Discrete approaches involve one specific process or action (e.g., teacher training), multifaceted strategies combine two or more discrete strategies (e.g., program packaging + teacher training + implementation facilitation), and blended refers to multifaceted strategies that have been protoco-lized (Lyon et al., 2019; Powell et al., 2012; Walker et al., 2022). Unlike most classroom-based PA interventions, InPACT includes a suite of implementation strategies to support tailoring to the unique needs of the setting; this is consistent with what Brownson et al. (2013) called designing for dissemination. These strategies were informed by the School Implementation Strategies-Translating Expert Recommendations for Implementing Change Resources taxonomy (Cook et al., 2019) and, as depicted in the InPACT implementation research logic model, focused on reducing mul-tilevel implementation barriers in low-resource schools to promote intervention fidelity, effectiveness, and sustainment (Figure 2).

Overcoming Barriers Associated With Intervention Characteristics

InPACT was originally developed with multifaceted strategies to mitigate universal individual, intervention, and inner setting implemen-tation barriers in elementary schools. These barriers focused on the implementer and inner setting domains and included teacher time constraints, low teacher self-efficacy, student behavior, and space constraints of classrooms. To overcome the barrier of time constraints, we developed a compendium of physical activities (Beemer et al., 2018) to reduce out-of-class prep time for teachers and identified online videos that teachers could use in their class-rooms. The compendium was developed in compliance with health-enhancing exercise physiology principles and included 200 MVPA breaks for teachers to use and adapt for their class-rooms. To overcome the barrier of low teacher self-efficacy in implementing MVPA breaks, we also developed exercise training videos (Beemer et al., 2018) to help guide intensity using tempo and visual cues. The videos provided encouraging prompts to motivate the students to continue exercising the entire time, including an activity time-lapse countdown with music and a heart rate guide. Seven videos were developed and were accessible to teachers via the study website. Teachers were also provided with target heart rate zone posters and instructions for teaching their students to manually take their carotid pulse to ensure they were in the moderate to vigorous heart rate zone during the classroom PA breaks (Beemer et al., 2018). To overcome the barrier of student behavior, we developed classroom management procedures to help teachers efficiently implement activity breaks (Beemer et al.,

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**Figure 2** — Implementation research logic model for InPACT. Adapted from “The implementation research logic model: A method for planning, executing, reporting, and synthesizing implementation projects,” by J.D. Smith, D.H. Li, and M.R. Rafferty, 2020, Implementation Science, 15, p. 84. InPACT = Interrupting Prolonged sitting with ACTivity; TOT = training of trainer; REP = replicating effective programs; ISD = intermediate school district; PA = physical activity.
Overcoming Barriers Related to Individual Characteristics: Low Student Engagement in PA

Enjoyment of PA is a key motivator of current and future PA participation. Indeed, many children who regularly participate in PA often cite “enjoyment” as a contributing factor (Deforche et al., 2006). Chronic stress exposure in children experiencing socioeconomic disadvantage has been associated with lower enjoyment, motivation, and participation in PA (Brodersen et al., 2005; Lundahl et al., 2013; McGlumphy et al., 2018). To reduce the barrier of low student engagement in low-resource schools, our team developed a discrete implementation strategy of gamifying the InPACT intervention (Beemer et al., 2019). Gamification is the application of game design elements and principles applied in nongame contexts and is commonly used by school teachers to improve motivation, engagement, and student performance (Deterding et al., 2011). Gamification has also previously been applied to motivate behavior change related to PA (Landers & Landers, 2014).

Grounded in goal-setting theory (Lunenburg, 2011), we gamified InPACT by setting attainable classroom goals, providing weekly feedback on student progress toward meeting the goal, and establishing an end-of-study reward to motivate behavior change toward increased PA levels (Beemer et al., 2019). Goals were classroom specific and based on the average percentage of students exercising at the prescribed intensity at Week 13 of the intervention. Each week that the class met its goals, a new goal was implemented (i.e., a 5%–10% increase in student participation the following week, which equated to one to two additional students exercising at the prescribed intensity). Incentives included daily, weekly, and postintervention prizes. A unique aspect of this reward system was that PA was rewarded with more activity, thereby associating exercise with success. For example, the postintervention prize included a field day (2 hr of structured outdoor play), which was awarded to classrooms that met their participation goal six out of the seven gamification weeks.

Our gamification protocol was pilot tested in nine third- to sixth-grade classrooms in one low-resource school (n = 292 students; 80% FRL) participating in the 20-week intervention (Beemer et al., 2019). Gamification resulted in a 27% increase in student MVPA participation during the gamified intervention weeks compared with the standard intervention weeks. These findings provide preliminary evidence that gamifying activity breaks may be an important implementation strategy for overcoming the individual-level barrier of low engagement to participate in classroom activity breaks.

Overcoming Barriers in the Inner Setting: Poor Implementation Climate Supporting PA, Competing Priorities, and Lack of Administrative Support

Addressing key inner setting barriers, including poor implementation climate (organization’s shared perception about the importance of implementing PA interventions; Ehrhart et al., 2014; Lyon et al., 2018), competing priorities, and lack of administrative support, requires balancing flexibility and fidelity in intervention delivery to enhance public health impact in classroom settings (Hasson et al., 2021). Enhanced replicating effective programs (enhanced REP) are especially well suited for tailoring evidence-based behavioral interventions as they use relatively low-burden, low-cost implementation strategies to overcome barriers to intervention uptake and equity (Kilbourne et al., 2014, 2018). Guided by the social learning and diffusion of innovations theories (Bandura, 1977; Rogers, 2003), enhanced REP is a multifaceted implementation strategy that bundles tailored program packaging and teacher training with implementation facilitation to provide schools with ongoing support (Kilbourne et al., 2014). Hence, enhanced REP addresses fundamental barriers to school-based intervention delivery and has been shown to improve the uptake of behavioral interventions in low-resource schools (Smith et al., 2022). We applied the enhanced REP framework to tailor InPACT program packaging, teacher training, technical assistance, and implementation facilitation processes to mitigate implementation barriers unique to low-resource schools (Hasson et al., 2021). The core function of InPACT was retained.

Tailored Program Packaging

Unique to other classroom PA interventions, in the tailored InPACT intervention, we adjusted the dose of classroom activity breaks and the timing at which they occur throughout the school day to...
minimize barriers in implementation (Hasson et al., 2021). The enhanced REP packaging process (Kilbourne et al., 2014) encourages teachers to identify ways to adapt the intervention without compromising the core elements so that they can do what is best for their students and curriculum. For example, the 20 min of classroom activity can be broken up into five 4-min activity breaks, two 10-min activity breaks, or even one full 20-min activity break. This tailored packaging provides more flexibility to help overcome the barriers of competing priorities in a poor implementation climate.

Tailored Training and Technical Assistance

Tailored InPACT also includes a day-long, in-person didactic training (Hasson et al., 2021). Teachers are trained to deliver tailored InPACT before implementation of the intervention. Training sessions provide the scientific rationale for tailored InPACT as well as study objectives, protocol, negotiables, and nonnegotiables. Teachers are trained in best practices related to classroom management, space constraints, teacher/student motivation, and inclusive PA. Teachers are given instructions on the potential risks of the study and how to prevent, treat, and address any injuries or health concerns (e.g., asthma; Beemer et al., 2022; Schwartz et al., 2022; or type 1 diabetes) during an activity break. Finally, teachers are trained on integrating PA breaks into their curriculum. A written guide, training videos, and all project materials are made available on the study website (www.inpact.kines.umich.edu). Tailored InPACT teacher trainings are also a registered program of the State Continuing Education Clock Hours, which allows teachers to receive continuing education credits for their attendance at trainings (Whitt-Glover et al., 2011). After training, technical assistance is provided in the form of weekly newsletters with information on tailored InPACT resources and links to exercise videos. The tailored teacher training and technical assistance were deployed to overcome the barrier of low teacher self-efficacy.

Implementation Facilitation

In line with prior studies (Kilbourne et al., 2018; Smith et al., 2022), classroom teachers are currently being supported in the development of strategic thinking, leadership skills, and reduction of barriers related to tailored InPACT delivery through a five-step process. This process includes helping classroom teachers set measurable goals (e.g., reducing activity break transition times to increase instructional time), identifying teacher strengths to build self-efficacy, aligning tailored InPACT delivery with existing school and administrator values and priorities, providing guidance on overcoming school barriers to tailored InPACT delivery, and increasing engagement with administrators and other support staff. Previous research has demonstrated that teachers are more successful in implementing PA breaks when they are provided monthly support from a facilitator compared with teachers who received one-time training only (Delk et al., 2014). Enhanced REP along with facilitation has also resulted in the improved uptake of a cognitive behavioral therapy intervention by school professionals compared with extended training (coaching; Smith et al., 2022).

The tailored InPACT intervention was disseminated to teachers in one additional low-resource school (80% FRL). Throughout the intervention period, teachers achieved intervention dose (i.e., fidelity: five classroom activity breaks per day at an average duration of 4 min, 8 s), enabling children to accumulate up to 21 min of PA per day in the classroom. One month postintervention, 89% of teachers were voluntarily implementing classroom activity breaks in their classrooms, which spoke to the high feasibility and short-term sustainment of the tailored InPACT (Hasson et al., 2021). Tailored InPACT was redeployed to a midresource school (54% FRL) during the pandemic to identify potential facilitators for InPACT implementation. During mid- and postimplementation, teachers (N = 22) were surveyed on their perceptions of the InPACT intervention, its influence on student behavior, and their self-efficacy to implement InPACT (unpublished data, R.E. Hasson, 2022).

- InPACT intervention (midimplementation): Teachers reported that the InPACT program packaging (classroom management posters, floor plans, and heart rate posters) and technical assistance (weekly newsletters, monthly school visits by program staff) were helpful for successful InPACT delivery.
- Student behavior (midimplementation): When asked, “What difference, if any, has InPACT made for your classroom?” 95% of teachers responded positively, citing improved students’ focus, engagement, and the activity breaks being a productive outlet for energy. When asked, “What, if any, behavior changes have you observed since implementing InPACT?” 82% of teachers responded positively, citing fewer behavioral issues and improved student self-regulation. When asked, “What, if any, academic changes have you observed since implementing InPACT?” 68% of teachers responded positively, citing improved student test scores. Finally, when asked, “What, if any, changes have you observed in the overall mood of students when engaging in classroom PA?” 86% of teachers reported positive mood changes, citing student enjoyment, happiness, and excitement related to activity breaks.
- Self-efficacy (postimplementation): Survey responses also suggested that there was a 9% increase in teacher self-efficacy postimplementation at the end of the school year compared with preimplementation.

These findings suggest that our multifaceted strategies (program packaging, teacher training, technical assistance, and implementation facilitation) increased teacher self-efficacy and their perceptions of positive student behavior.


Barriers within the outer setting also have a notable influence on effective implementation of interventions (Weiner, 2009). This is particularly true in low-resource schools, which report additional district- and region-level barriers to successful implementation, including resource constraints (Schneider et al., 2012) and teacher turnover/understaffing (Blaine et al., 2017), as well as environmental barriers, including percentage of students eligible for FRL (Crosnoe, 2009). All too often, evidence-based programs are adopted with teacher training initiated immediately without any consideration of the organizational capacity and policies in place to support implementation (Klesges et al., 2005; Koorts et al., 2018). Moreover, lack of planning can result in a disconnect between actions and priorities within the inner and outer setting, which can impede intervention implementation (Wanless et al., 2013).
By building the infrastructure for intervention effectiveness and sustainment before training and intervention delivery begins, the likelihood of implementation success can be substantially increased (Domitrovich et al., 2008).

We worked collaboratively with regional school health coordinators, school administrators, and staff from one low-resource, low-active, intermediate school district (ISD; 32 schools; 73% FRL) to conduct needs assessments and systematically assess outer setting barriers to InPACT implementation across the ISD (Hasson et al., 2022). This work was guided by the exploration, preparation, implementation, sustainment (EPIS) framework, which used a four-phase approach to describe the implementation process and aided in the determination of organizational capacity to adopt InPACT (Aarons et al., 2011, 2012). The exploration phase began with the recognition of an issue that needed attention (i.e., low PA levels of children) and continued with stakeholder engagement to evaluate (a) intervention–context fit at the ISD level, (b) district-wide PA policy strength and comprehensiveness, and (c) staff perceptions of administrative support and priorities for PA programming across the ISD. This evaluation was guided by determinants identified in the EPIS framework. System-level barriers identified included (a) limited structural capacity to sustain teacher trainings, (b) limited resources across districts and school buildings to support teachers, and (c) misalignment of ISD and district PA policies and practices. Following identification of key barriers, the preparation phase included the design of implementation strategies to overcome key barriers. Again, the focus was placed on systematically matching our implementation strategies to key barriers to enhance the likelihood of InPACT implementation success. Multifaceted strategies were designed with consideration of district-level and ISD-level capacity and existing infrastructure to optimize sustainable approaches.

To mitigate the barrier of limited structural capacity to sustain (ongoing) teacher training, a training-of-trainer model was used. Unique to the state of Michigan, regional school health coordinators, who represent 24 coordinating sites in Michigan, serve as hubs for delivering evidence-based programs driven by current state and local data, research, and educational requirements. Our training-of-trainer programming engages these experienced trainers in coaching new trainers who are less experienced with a particular topic, skill, or training (Centers for Disease Control and Prevention, 2019). These training sessions consist of a basic overview of the InPACT program and instructions on how to effectively use the InPACT program guide. This strategy is aimed at building a cohort of competent instructors who can then teach the material to other individuals. By partnering with these coordinators and using the existing state infrastructure, implementation supports can be universally disseminated to teachers to overcome implementation barriers.

To address limited resources across districts and school buildings to support teachers, a district-wide implementation guide was developed to guide resource management for effective InPACT adoption. By pooling resources (equipment, personnel, effort, etc.) administrators working in low-resource schools can maximize their assets to promote systemwide change in structured PA opportunities. The implementation guide also provides a step-by-step process on how to conduct needs assessments, policy evaluation, and process evaluation and overcome barriers related to InPACT implementation. Because regional school health coordinators have specific expertise in supporting health-related program implementation in schools, the implementation guide also provides specific structure around assessment, evaluation and support strategies related to InPACT implementation. This written guide is available for download on the program website (http://inpact.kines.umich.edu).

To address misalignment of ISD and organizational PA policies and priorities, a continuous improvement plan was developed to engage district stakeholders (e.g., 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. This process included district self-evaluation, tailored policy language, and ISD/district partner workshops (Friday et al., 2022). Together, these findings suggest that 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.

Although support for InPACT dissemination and implementation has been garnered among regional school health coordinators, alignment of InPACT with existing statewide health initiatives was critical for continued support. Alignment (the process of creating fit between elements of the inner and outer context of an organization or system) has been identified as important for implementation outcomes (Lundmark et al., 2021). In the context of implementing and sustaining classroom-based PA interventions, alignment involves creating fit between InPACT and the state health curriculum, Michigan Model for Health™ (MMH), as health coordinators’ primary responsibility is to provide MMH trainings for teachers. MMH is an evidence-based, comprehensive health education curriculum that targets Pre-K through 12th grade students, utilizing a skills-based approach. The curriculum teaches students the knowledge and skills needed to build and maintain healthy behaviors and lifestyles, including PA. Age-appropriate and sequential lessons focus on the most serious health challenges that school-aged children face. The MMH is written to align with the National and Michigan Health Education Standards and is recognized as an effective social emotional learning curriculum by the Collaborative for Academic and Social Emotional Learning (2021). MMH is also included in the National Registry of Evidence-based Programs and Practices (Substance Abuse and Mental Health Services Administration, 2014).

To eliminate the potential barrier of limited alignment with the state health curriculum, an alignment analysis was conducted by a school district consultant and the Michigan Department of Health and Human Services (MDHHS) to identify the commonalities and complimentary components between the InPACT program and MMH (unpublished data, Schwartz et al., 2022). Key commonalities identified included that (a) both programs are available and applicable to multiple grade levels, (b) both programs are accessible and based on research, (c) both programs provide strong professional development and support for teachers, and (d) both programs are affordable (InPACT is a free program, and the MMH is offered free or low cost to Michigan schools). Key delineations between the two programs included that (a) InPACT focuses more heavily on PA, with strong linkages to other areas of health, and MMH takes a comprehensive health approach, targeting many health behaviors equally; (b) InPACT uses online videos and resources for core instruction, teacher support, and outreach to families, whereas MMH offers print and online curriculum and resources as well as online and in-person teacher support; and (c) InPACT is used five times a day, at any time, in short 4 min segments, and MMH is to be taught at a designated class time or in a health class and ranges from 20 to 50 min per lesson, depending on grade. MMH is not used daily unless in a health education class.
The analysis of each program showed that there were many commonalities and complementary themes and not any clear-cut duplication of effort. Through the process of alignment, there appeared to be many opportunities for InPACT to support and supplement MMH, enhancing each program’s successful implementation. This analysis also helped to garner support from government stakeholders (i.e., MDHHS) for the implementation and dissemination of InPACT across the state. As a result, we developed a discrete implementation strategy of an integration guide to illustrate ways to efficiently use InPACT together with MMH. To promote joint implementation, this guide integrates InPACT with MMH content areas in each grade.

Avenues for Future Research

Our long-term goal is to equitably increase teacher and school system capacity to promote classroom PA to reduce the burden of inactivity on child health, well-being, and achievement. We have preliminary evidence that suggests that our tailored InPACT intervention is successful at reducing child disparities in classroom PA participation. In our classrooms, we have observed similar activity break participation rates among boys and girls (Beemer et al., 2018). These findings are similar to Reznik et al. (2015), who demonstrated that participation in a 10-min teacher-led activity break was equally effective in increasing step counts for both kindergarten and first-grade boys and girls. We also demonstrated that compared with students without asthma, a higher percentage of students with asthma participated in MVP during InPACT activity breaks (Beemer et al., 2022). Only six instances of asthmatic symptoms (coughing) were observed during the 20-week intervention in students with asthma following an activity break. Moreover, symptoms self-resolved within 15 min of the activity break and did not result in sustained exercise-induced bronchoconstriction. Our results to date are promising, well received by school administrators, and implementable, but rigorous research on InPACT’s effectiveness to increase classroom PA compared with usual PA programming is needed to build the evidence base for widespread dissemination and sustainment in low-resource schools.

An assessment of how our multifaceted implementation strategies work, in which settings, and for which population(s) is another important avenue for future research. For example, the enhanced REP implementation strategy (Kilbourne et al., 2014; packaging + training + facilitation) was designed to support teacher adoption and fidelity of the InPACT intervention by addressing two theoretically and empirically supported predictors of teacher practice: (a) increased self-efficacy (i.e., one’s confidence in one’s ability to perform a specific behavior; Bandura, 1977) and (b) reductions in implementation barriers related to InPACT delivery. Based on our implementation research logic model (Figure 2), an exploration of the following hypotheses is warranted: (a) higher dose of enhanced REP, especially number of facilitation contacts, will be associated with increased InPACT fidelity; (b) enhanced REP’s effects on InPACT fidelity will be partially mediated by improved teacher self-efficacy leading to increased InPACT fidelity; (c) enhanced REP’s effects on InPACT fidelity will also be partially mediated by teacher perceived reduction of implementation barriers; and (d) the self-efficacy mechanism and the implementation barrier reduction mechanism will explain unique variance in InPACT implementation fidelity.

Finally, estimating the economic costs of InPACT implementation from the teacher and school administrator perspective is another key avenue for future research. Stakeholders across different levels experience different economic impacts (costs, benefit, and value) related to intervention implementation and have different perspectives on these issues (Eisman et al., 2021). For example, teachers may view reductions in disruptive behavior and increases in time available for instruction as a favorable return on investment, whereas school administrators may focus on the opportunity costs (the value or benefit given up by adopting tailored InPACT relative to adopting an alternative program). Estimating the costs of tailored InPACT implementation versus usual PA programming from multiple perspectives, including implementers (i.e., teachers) and leadership (i.e., administrators), using microcosting and cost–benefit analyses is a vital next step in advancing the application of implementation science and health equity to close the gap in classroom PA adoption and fidelity to improve child PA and health.

There are substantial gaps in research on tailored PA interventions designed to equitably enhance teacher delivery of classroom PA. Most classroom-based PA interventions to date have used an equality-based approach to increasing PA participation (Centers for Disease Control and Prevention, 2018). In essence, single-level interventions with similar educational, informational, and economic resources for increasing PA are provided to diverse community schools, irrespective of the resources and needs that each school has to help its students achieve the recommended amount of daily PA (Hasson, 2017). Our work in schools across the state of Michigan reveals the need for equity in classroom-based PA interventions (Beemer et al., 2018; Hasson et al., 2021). Equity, in this case, refers to overcoming multilevel barriers to implementation and tailoring supports to meet the unique needs of low-resource schools. In the absence of tailored, low-cost approaches to promoting PA in the classroom, interventions may exacerbate the very disparities that researchers and policymakers are trying to mitigate.

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