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A Qualitative Study of the Benefits and Challenges of Fitness Testing and Activity Monitoring in School; Interviews with School Staff in Southern California

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ABSTRACT

Background: School-based physical fitness testing (SB-PFT), though widely utilized, continues to be a topic of debate over its utility and feasibility.

Purpose: A qualitative study among K-12 school personnel elicited information about challenges to and recommendations for SB-PFT implementation and explored perceptions of activity monitoring as an alternative or supplement to SB-PFT.

Method: Interviews conducted with 13 California public school personnel were transcribed and qualitatively analyzed to identify themes and select exemplary quotes.

Results: Whereas one-third of respondents were positively disposed toward SB-PFT, two-thirds were positively disposed toward activity monitoring. Thematic analysis yielded three benefits to SB-PFT and six challenges, compared to six benefits of activity monitoring and two challenges. The discrepancy was especially relevant to less active students.

Discussion: Participants were more optimistic about the use and importance of activity monitoring compared with SB-PFT. Activity monitoring as an alternative or supplement to SB-PFT deserves exploration.

Translation into Health Education Practice: This study yielded recommendations for implementing SB-PFT to promote youth physical activity. Recommendations include conducting multiple assessments during the school year, providing opportunities to practice the SB-PFT, and utilizing activity monitoring as an adjunct to SB-PFT. Teachers would benefit from clear guidelines for integrating physical activity monitoring into SB-PFT.

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Introduction


Physical inactivity is a behavioral pandemic (Hall et al., 2021; Pratt et al., 2020) that begins during childhood and adolescence (World Health Organization, 2022), and an analysis of 1.6 million students across the globe in 2016 found that 81% did not meet physical activity (PA) guidelines (Guthold et al., 2020). Although a comparable global estimate of youth meeting PA guidelines has not been issued since 2020, a report on the Global Matrix 4.0 Physical Activity Report Card (Aubert et al., 2022), published in 2022, concluded that “the average grades calculated for the 10 PA common indicators were all between D and C+, indicating that we are not succeeding at promoting PA among children and adolescents globally” (p. 709). To address this problem, there is a compelling need to improve adolescent physical activity surveillance (van Sluijs et al., 2021).

Historically, PA surveillance has been accomplished through self-report. The Youth Behavioral Risk Surveillance System (YRBSS) in the United States,

conducted by the Centers for Disease Control and Prevention every 3 years, provides estimates of the proportion of high school youth meeting PA guidelines, and data from 2023 (Centers for Disease Control and Prevention, 2025b; Michael et al., 2023) found that only 25% high school students met recommended PA guidelines. Data from 2019 (the most recent date for which California-specific data are available) show that 38.7% California high school students met PA guidelines (Centers for Disease Control and Prevention, 2025a). While useful as a periodic indicator of the health of the nation, such sample-based surveillance systems do not facilitate the evaluation of interventions or enable identification of effective local policies. To afford these evaluative functions, data are needed at the local community level.

Standardized school-based physical fitness testing (SB-PFT), usually including an assessment of cardiorespiratory fitness, has been used and/or recommended as a strategy to inform policies, practices and resource allocation (Egan et al., 2024; Joensuu et al., 2024; Murray et al., 2012;

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Ortega et al., 2024). Although an indirect assessment of PA, cardiorespiratory fitness is associated with PA (Husøy et al., 2024) and can be estimated using standardized SB-PFT (GreenLight Fitness, 2024). Schools, and in particular physical education (PE), play an established role in promoting PA (McKenzie & Lounsbury, 2014) and thus provide a natural context for implementing fitness testing. In 2021, 16 states in the United States mandated SB-PFT, and 10 of those posted the data (aggregated and deidentified) publicly (Krochmal et al., 2021). The authors of that study recommended that SB-PFT should be implemented routinely for the purposes of monitoring individual student progress, monitoring and improving PE programming, and informing regional and national policies. The evidence suggests, however, that whereas fitness testing may yield data that are useful for surveillance purposes, PE teachers are concerned that fitness testing can have a negative impact on students' psychological well-being (Beresini, 2024; Harte et al., 2024) and many students' experiences of fitness testing lack meaning and involve little learning that extends beyond the lesson (Harte, 2025).

It should be noted that PA and physical fitness, while related, are significantly distinct concepts. A widely used definition of PA describes it as “any type of bodily movement, produced by skeletal muscles, that results in energy expenditure” (Caspersen et al., 1985, p. 126), whereas a recent wholistic definition posits that “physical activity involves people moving, acting and performing within culturally specific spaces and contexts, and influenced by a unique array of interests, emotions, ideas, instructions and relationships” (Piggin, 2020, p. 5). Physical fitness has generally been defined as “the ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure-time pursuits and meet unforeseen emergencies” (Caspersen et al., 1985, p. 128), while the 1996 Report of the Surgeon General on Physical Activity and Health describes physical fitness as a set of attributes that people have or achieve relating to their ability to perform physical activity (National Center for Chronic Disease Prevention and Health Promotion & President's Council on Physical Fitness and Sports, 1996). Further, PA has been shown to benefit health independently from fitness (Myers et al., 2015). That is, engaging in the behavior that comprises physical activity (bodily movement) often results in health benefits (e.g., improved psychological well-being) even in the absence of measurable increases in physical fitness. Therefore, in selecting strategies for monitoring the health of youth it is critical to be mindful of the distinctions between PA and fitness.

Between 1999 and 2019, SB-PFT was mandated in 5th, 7th, and 9th grade in all public schools in California. The test adopted by the state was the FitnessGram (GreenLight Fitness, 2024), which is comprised of separate assessments

of aerobic capacity, muscular strength, muscular endurance, flexibility, and body composition. For two decades, student-level data were entered into a central database, deidentified, and posted to a publicly accessible website (California Department of Education, 2024). These data enabled research to inform policy and gave school districts information that they could use to allocate and advocate for resources. At the student level, however, the impact of SB-PFT has not been documented, and in the spring of 2020 the California Legislature passed State Senate Bill (SB) 820 (Chapter 110, Statutes of 2020) Section 68, which amended California Education Code (EC) Section 60 800 to suspend the administration of the Physical Fitness Test (PFT) for the 2020–21 school year. The Bill instructed the State Superintendent of Public Instruction to carry out a research study of the value, importance, and impact of SB-PFT and to submit a report with recommendations regarding the purpose and administration of fitness testing. Although the text of the legislation referenced the COVID pandemic as the impetus for the SB-PFT pause, media reports preceding the pandemic suggested that the Governor of California was already considering a pause because of concerns about student bullying and the lack of adaptability of SB-PFT for nonbinary students and those with physical limitations (Beresini, 2024).

The report generated by the legislatively mandated research was subcontracted to the Sacramento County Office of Education and is publicly accessible on the California Department of Education website (Assessment Development and Administration Instruction, 2023). Recommendations were based on a survey of 1,061 public school staff in California and called for the development of a new program of physical fitness assessments for California. The questions on the survey are included in an Appendix to the Assessment Development and Administration Instruction report to the legislature and were specifically designed to elicit information about problems with or limitations of the FitnessGram. No information was collected about the potential utilization of PA monitoring as an alternative or supplement to fitness testing. This omission is notable, given advances in technology that make widespread activity monitoring increasingly accessible (e.g., Steene-Johannessen et al., 2021). The current study addressed this gap by inviting California public school staff to share their opinions about and experiences with fitness testing (FitnessGram) and PA monitoring in schools.

Purpose

This study was undertaken to inform the development of a new program of physical fitness assessments and to address limitations of the recent state-funded survey.

Specifically, whereas the state-funded survey focused exclusively on problems associated with SB-PFT, we sought to elicit perceptions of both the benefits and the challenges of SB-PFT. In addition, we extended the inquiry to include perceptions of the benefits and challenges of PA monitoring using wearable devices, such as a Fitbit or Garmin watch. In an environment of shifting PE policies, we sought to document the thoughts, experiences, and recommendations of school staff regarding both familiar and potential new strategies for evaluating student health in PE.

Methods

Study setting

This study was conducted in partnership with the Orange County Department of Education in California. In the 2023–2024 school year 79% of students were people of color and 51% were eligible for free or reduced-price meals (Ed Data Education Data Partnership, 2024). At the time of the interviews conducted for this study, the California physical fitness test mandate had been reinstated, but schools were no longer required to assess height and weight and data from the fitness test were no longer reported to a central database. SB-PFT data prior to 2020 are still available through the California Department of Education website (<https://data1.cde.ca.gov/dataquest/>) in aggregate by school and/or district, and individual student-level data were inconsistently shared with students and their families (see survey results in Assessment Development and Administration Instruction, 2023).

Research paradigm

This study aligns with standards for reporting in qualitative research (O'Brien et al., 2014). We took an interpretive phenomenological approach (Gill, 2014), which was consistent with our aim to identify and articulate commonalities in the experiences of school staff related to both their lived experiences of implementing SB-PFT and their perceptions of the potential for utilizing wearable PA monitors in the context of PE. Consistent with this approach, we conducted interviews until no new themes emerged (i.e., saturation). The interview guide was developed by the first author with input from one senior Physical Education teacher, one school district employee overseeing SB-PFT and three academic researchers with expertise in adolescent fitness and school-based research, and was informed by the assumption that physical literacy (Cornish et al., 2020) acts as a mediator between PE-based assessments and

improvements in student fitness and/or activity levels. Accordingly, the interview invited participants to reflect on how SB-PFT or activity monitoring contributed to facets of physical literacy; students' motivation, confidence, competence, knowledge, understanding, and behavior related to physical activity.

Procedures

Participants were recruited through invitation e-mails sent by community research partners with the Orange County Department of Education to existing lists of school personnel in Orange County, California (i.e., 307 individuals in a Physical Education Network, 776 individuals in a School Health Services Network, and 849 school Principals). After completing a screening survey to verify that potential participants had experience implementing or supervising SB-PFT and to obtain contact information in Research Electronic Data Capture (REDCap)¹ (Harris et al., 2009, 2019), eligible respondents were invited to complete a brief online survey and an interview. In addition to background information, the survey asked three questions that had been included on the Physical Fitness Testing Experience and Guidance Study (Assessment Development and Administration Instruction, 2023): (1) Have you received concerns or feedback in the past from students, parents, or teachers about the [physical fitness test] or how it is administered? (Yes/No); (2) Do you have any concerns about the equitable assessment of student fitness? (Yes/No); and (3) How has the [physical fitness test] data been used or shared in the past at your school district? (Mark all that apply). Table 1 shows the response options for how the testing data had been used.

Videotaped interviews were conducted over Zoom by the first author in January, February, and March of 2024 and were recorded and transcribed verbatim. Interviews were conducted in small groups of 2–4 people using a semi-structured script (see Moderator's Interview Guide in Supplementary Materials) comprised of a series of open-ended questions that was modified slightly throughout data collection as recommended for utility-focused qualitative research (Patton, 2014). Owing to scheduling challenges, and to be as inclusive as possible, one participant was interviewed one-on-one. Comparison of themes across the interviews showed that the one-on-one interview yielded information consistent with the group interviews. Changes to the moderator guide were minimal and primarily resulted in a more streamlined interview that minimized redundancies. One question was added to the end of the guide after the first two interviews: What do you think about how fitness testing is currently being done in the

Table 1. Participants' experience with fitness testing ($n = 13$).

Items	% (N)
Implemented or supervised fitness testing six or more times	62% (8)
Have received concerns or feedback in the past from students, parents, or teachers about school-based physical fitness testing or how it is administered	30% (4)
Have concerns about the equitable assessment of student fitness	46% (6)
How have fitness data been used?	
Shared with students	61% (8)
Shared with Parents	38% (5)
Shared with PE teachers	77% (10)
Shared with school sites	54% (7)
Results discussed at site meetings	23% (3)
Results discussed at district meetings	31% (4)
Reported on student progress reports or report cards	15% (2)
Used for Local Accountability Measures	7% (1)

schools? The individual interview was included to accommodate the scheduling needs of one participant. Prior to the first question, the interviewer provided the following information for context: "When I mention school-based fitness testing I am talking about standardized approaches to measuring physical fitness of individual students in the school setting. In California, this has been done in recent years using the FITNESSGRAM, which includes multiple components. If you are familiar with the FITNESSGRAM, then you can think about that every time I reference school-based fitness testing. If you are not familiar with the FITNESSGRAM, you can think about the Timed Mile Run. When I mention physical activity monitoring, I would like to you to think about using wearable monitors, like a Fitbit or Garmin watch, to measure how active a student is for a full week."

Participants received a \$50 gift card in compensation for their time. The research protocol was registered with the Institutional Review Board (IRB) as exempt from review owing to being no more than minimal risk and all data being de-identified for analysis.

Data analysis

To enhance the credibility and trustworthiness of the data analysis process, data coding was carried out by two coders with extensive experience both conducting physical activity research in public school settings and also creating codebooks from qualitative data. The first author has been conducting school-based intervention research to promote adolescent PA for over two decades. The second author spent 4 years as a project coordinator for a school-based research study, including conducting cardiorespiratory fitness tests and collecting activity monitor data from students. To enhance the credibility and trustworthiness of the interpretations of the data, the results and discussion sections were produced in close collaboration with the third and fourth

authors, both of whom worked as PE teachers prior to pursuing graduate education in curriculum design and pedagogy. The third author currently works as a Physical Education Coordinator within the Orange County Department of Education, and the fourth author is a University Lecturer teaching classes on PE curriculum, pedagogy, and assessment. None of the authors had any relationship with the study participants prior to the interviews, and none maintains a supervisory relationship with the study participants.

De-identified interview transcripts were uploaded to Atlas.ti (ATLAS.ti Scientific Software Development GmbH [ATLAS], 2023), a computer-assisted qualitative data analysis software that facilitates analysis of qualitative data, and were qualitatively coded using a multi-stage process in which codes were iteratively identified. The first author read through all the transcripts and constructed a draft coding guide. This guide and two interview transcripts were then shared with the second author for feedback. A revised coding guide was then used by both coders independently to code the full set of interview transcripts. Differences in coding were resolved by discussion leading to consensus, and new codes were created when at least three research participants made the same point that did not align with an existing code. A final codebook was produced with illustrative quotes for each code, organized into themes and subthemes (see Codebook in Supplementary Materials). As indicators of the robustness of each code, the analytic functions of Atlas.ti were utilized to calculate how many times a code appeared overall across all interviews and how many participants shared comments that aligned with each theme.

Results

Thirty-two individuals completed the screening survey (23 PE teachers; eight school administrators; one PE

teacher/administrator). Among PE teachers, 74% administered SB-PFT within the last 12 months, and 89% administrators supervised SB-PFT within the last 12 months. The 32 interested individuals represented 28 different schools (9 high schools; 9 middle schools; 10 elementary schools) and 1 school district from 13 cities within Orange County, California.

Thirteen individuals (41% response rate) completed an interview (85% PE teachers; 15% administrators). Among the 11 PE teachers, 68% had administered SB-PFT within the last 12 months, and 100% of the 2 administrators had supervised the testing within the last 12 months. The 13 interview participants represented 11 different schools from 8 cities (4 high schools, 5 middle schools, and 2 elementary schools). Thus, the interview sample was very similar to the larger group who had expressed interest in participating. Participants varied in age (31% between 26 and 44; 23% between 45 and 50, 46% between 51 and 70) and were 31% male. The majority were non-Latino white (81%), one identified as Latino, and one declined to identify an ethnicity. [Table 1](#) shows additional information obtained from the participants in the pre-interview survey.

Overall evaluations of fitness testing and activity monitoring

Only 38% of participants supported fitness testing in schools, and most of the relevant statements referred primarily to support for collecting some sort of assessment data in PE (e.g., “Just like any data we collect it would be valuable to look at trends”). On the other hand, 61% of participants opposed fitness testing in schools and often expressed this opposition in strong terms, such as “I think it is doing more harm than good” and “I really don’t like the whole thing just so you know. I will say that right up front.” In contrast, 61% of participants supported using activity monitors in schools. Such comments occurred frequently during interviews (i.e., 25 times) and often as an expression of preference for activity monitoring above fitness testing. None of the participants opposed using activity monitors in schools.

Personal experience with fitness testing and activity monitoring

As expected, given the state mandate for SB-PFT, all 13 interview participants recounted personal experiences with implementing fitness testing in schools, and these kinds of comments were coded 60 times across all the interviews. Although nearly all (12 out of 13) of the interview participants also reported personal experience

using activity monitors, these comments were coded only 26 times across all the interviews, and many were about their own use of activity monitors, not in relation to the students. Interview participants often did not distinguish between activity monitors and other types of monitors (e.g., heart rate monitors) when sharing their experiences using them in schools, and most reported short-term or pilot projects. For example, one teacher shared that, “A few years ago we did have a grant where we handed out pedometers to the students. Just during our class time, we would pick a random group of 6 and for 3 days, 3 school days and one weekend day we would collect the data. I felt like the kids who used it kinda felt like they got to see right away how much they did.” Several reported that changes in PE around the time of the pandemic stimulated the uptake of activity monitors: “We invested in these technologies early on, it was for a new type of PE class, a hybrid PE class. Students would meet with the instructor once a week and they relied on the student to meet the physical fitness requirements on their own independently and recording that data using the technology.”

Fitness testing

Benefits

Benefits of fitness testing reported by participants focused on a single theme related to potential outcomes of the testing and aligned with three sub-themes: the possibility that students might discover a new skill; the potential for students to learn basic physical skills; and the opportunity for schools to use the data to advocate for resources in PE.

Recommendations

The interviews yielded many recommendations about the way that fitness testing should be implemented, which were organized into three themes related to actions that could be taken before, during and after the testing. Two sub-themes were identified related to recommendations for actions leading up to the testing: explaining the purpose of the fitness testing to the students and giving them the opportunity to practice. Among the three sub-themes relevant for recommended practices during the testing, 11 out of 12 participants mentioned that the testing should be carried out at the beginning and end of the year to enable tracking of progress. Participants also recommended that the tests should be administered in a standardized manner and that fitness testing should be personalized for the student, meaning that scores should be shared with students individually and not compared with population norms. Four sub-themes emerged regarding

recommendations for actions to take after fitness testing. All participants mentioned using the fitness data to show personal improvement over time. Participants also recommended using fitness data to encourage students to reflect on their behavioral choices, support individual goal setting, and share the data with families.

Challenges

We identified four themes related to the challenges to conducting fitness testing: concerns about the data quality; comments related to the context within which PE operates; how students respond to fitness testing; and the impact of fitness testing on the PE class. Concerns about data quality related to the sub-themes that current testing standards are outdated and that fitness testing administration is not standardized across PE teachers. Together, these concerns undermined confidence in the value of the fitness tests and created a situation in which PE teachers were not motivated to place a high priority on the testing and/or testing protocols. Comments related to the context for fitness testing aligned with the subtheme that PE is undervalued within the institutional structure and the subtheme of a high school PE policy that allows students to apply for an exemption from PE if they participate in an organized sport. All comments within the theme of students' responses to fitness testing conveyed students' antipathy toward the fitness testing (respondents used the words "embarrassed," "negative connotation," "terrifying," "nightmare," and "discouraging" to describe students' experiences with SB-PFT), while all comments about the impact of fitness testing on the PE class referenced the dedication of class time to the testing, which conflicts with other class priorities.

Activity monitoring

Benefits

Among the benefits of using activity monitors in schools, three themes emerged: (1) outcomes of using activity monitors; (2) students' likely responses to the activity monitors; and (3) features made available by the activity monitor technology. In terms of the potential outcomes, there were four subthemes. Participants unanimously mentioned the monitors' ability to provide rapid, real-time, and personalized feedback to students about their activity. Almost all participants noted that activity monitors could be used to obtain information about other behaviors as well, such as sleep or nutrition, and that they therefore might act as a gateway to a holistic approach to health. It was also noted that the monitors were likely to spark conversations between

teachers and students and among the students. Finally, some participants mentioned that the activity monitors might encourage friendly competitions.

Comments grouped under the second theme, that of students' likely responses to the monitors, fell into two subthemes: participants' expectation that students would be receptive to using activity monitors and that they would enjoy doing so. One subtheme was comprised of comments regarding students' affinity for technology and the likely embrace of a wearable device as an appealing accessory. The other subtheme in the category of student response tapped into expectations that students would enjoy the experience of using an activity monitor.

The third theme of activity monitoring benefits concerned the technological features of activity monitoring and included four subthemes: providing students with information that was personalized; setting behavioral goals; networking with a social group; and/or incentivizing PA through gamification.

Recommendations

Recommendations for using activity monitors in schools were grouped into two themes. One theme concerned ways that the activity monitor data could be used, and the other concerned recommendations related to the devices themselves. Among the comments describing ways the activity monitor data might be used, the most prevalent subtheme was the potential for using the data to encourage students to reflect on their own behavior, including causes and consequences of being physically active. Other subthemes included the data being used to suggest specific actions, embedding the data within learning activities that would help students make sense of the data, and engaging the family in the goal of increasing youth PA. Comments related to the theme of device requirements aligned with two subthemes. Firstly, respondents emphasized that to realize the potential benefits of activity monitoring there would need to be enough devices to provide each student with their own monitor, and secondly, they noted that the device would need to have a user-friendly interface.

Challenges

There was only one challenge to activity monitoring that appeared with sufficient frequency across the interview participants to meet our threshold for being assigned a code: namely, the potential demand on teachers to deploy activity monitors through PE. Other concerns were raised by one or two participants and were captured with a "general challenges" code. These included potential privacy issues, the possibility that students

would lose the devices, and uncertainty about what to do with the data generated by the monitors.

One size does not fit all

A theme that emerged across the interviews, irrespective of whether the topic was fitness testing or activity monitors, was the diversity among the students and the need to tailor assessment strategies to different kinds of youth. Eleven out of the 13 interview participants made comments along these lines, and this theme emerged 34 times across all the interviews. One dimension on which students were noted to differ was their degree of comfort and experience with being physically active and, by inference, affinity for sports and/or fitness. One PE teacher said that “A majority of the kids I service are not in athletics after school and not going to get high in passing scores, so the fitness test for a majority of the students I service brings their self-confidence down and their enjoyment of PE down.” Another noted that “You will have a group of kids that ask each other about their scores, and then you will have the kids who are “Don’t look at me.”

Whereas fitness testing was viewed as more suited to athletic students, activity monitoring was viewed as potentially impactful among the less-active and/or introverted students. With respect to fitness testing, “They can see where they fit. These are scores we have taken for the last 15–20 years, and they want to know where they are. It does mean something to our very competitive kids. Maybe not so much the middle and bottoms, but like everything else it is a bell shape curve, and those kids are always going to want to be the top. There is an importance for it. It does not meet the needs for all of them but for some of them.” In contrast, among the less athletic and more introverted students, fitness testing as traditionally implemented was seen as a demoralizing activity. With respect to the Timed Mile Run, one PE teacher observed that “It was always: everyone was starting at the line at the same time, kids who go out ahead are gonna take off and leave everyone in the dust and then everyone else after that would throw in the towel. A lot of kids would just end up walking the track. Versus putting forth any effort. To try and then look to have failed is just the worst in middle school.” Activity monitors, on the other hand, were viewed as having greater potential to motivate participation in a physically active lifestyle among the less athletic and/or more reticent students: “[Activity monitoring] would be good for kids who are ‘everybody is looking at me’ shy kids, because then you can give them something

outside of the PE class, where they are still hitting some goals and where they are at in certain things. It definitely could be beneficial.”

Discussion

Although the immediate context for this study was the recent shift in policy in California that has placed SB-PFT in California public schools in an untenable position, there has long been much debate in both the exercise science and physical education pedagogy literature about the nature, value, and importance of fitness testing for children and youth (Naughton et al., 2006; Silverman et al., 2008). Advocates suggest that SB-PFT helps motivate, support, and develop “healthy lifestyles” (Wiersma & Sherman, 2008). Opponents argue that fitness testing can have persisting and negative impacts on students into adulthood, mainly due to embarrassment in front of peers (Ladwig et al., 2018) or that negative experiences during SB-PFT reduce motivation for lifelong PA participation (Corbin, 2010). Indeed, even when students are taught well using appropriate fitness education and develop their knowledge about SB-PFT, many students do not enjoy fitness testing (Mercier & Silverman, 2014). Our results may shed new light on these opposing views by highlighting that SB-PFT may be experienced differently by different groups of students. As reported by educators and administrators interviewed for this study, for the more athletic or competitive students, SB-PFT may be motivating and even enjoyable, whereas for students who are less comfortable being active and/or more introverted SB-PFT may be both aversive and demotivating.

As pointed out by the educational professionals interviewed for this study, the SB-PFT approach that was used by California from 1999 to 2019, and which is still deployed by many school systems, was developed some time ago, and may be ripe for a refresh. In this study, we undertook collecting data that would inform future practice and pedagogy, whether that be to improve fitness testing as it is implemented in the school setting, to introduce new methods of fitness testing, or to combine fitness testing with PA monitoring. Our findings are consistent with and extend prior work (Johnson et al., 2023) finding both potential and pitfalls in SB-PFT as it is currently implemented.

It is noteworthy that participants in this study reported more challenges than benefits in relation to SB-PFT and more benefits than challenges in relation to school-based PA monitoring. This finding is consistent with the overall evaluation of the two assessment methods that came through in the qualitative coding of the interviews; namely, all respondents were in favor of

using activity monitors in PE, whereas 61% were opposed to SB-PFT in PE. Participants especially remarked on the different emotional response of students to SB-PFT as compared to activity monitoring. Put simply, school staff reported that most students dislike SB-PFT and that most students would enjoy activity monitoring.

Prior studies have found that students tend to have a negative affective response to SB-PFT (Alfrey, 2023; Alfrey & Gard, 2014). Davis et al. (2018) highlighted that SB-PFT was one reason why female students did not participate in PE. It is also worth noting, however, that a persistent theme in the interviews conducted for this study was that not all youth are alike. According to the school staff interviewed for this study, students who are more athletic, more competitive, or more comfortable with PA in general may find in fitness testing an opportunity to demonstrate their competencies, experience a sense of achievement, or engage in an activity that they find enjoyable. Interviewees reported, however, that the typical student in PE does not fall into this segment of the population. As attested to by the participants in the present study and confirmed by all available epidemiologic evidence, most youth are not active at recommended levels. Moreover, many high school students who participate in competitive sports and are thus most likely to be comfortable with SB-PFT are eligible for an exemption from the school PE requirement (this is the case in high school in California).² Consequently, as noted by the participants in this study, most students in PE find the SB-PFT aversive.

There are ways that SB-PFT can be implemented that minimize student discomfort with the process, and many of the strategies mentioned by the participants in our study echo the recommendations offered in the FitnessGram manual (Corbin et al., 2013). These principles include preserving confidentiality of student data (i.e., do not post results publicly); integrating fitness testing into the PE curriculum; and preparing students for the testing by explaining the “why” and providing opportunities to practice. Other recommendations for effective implementation of SB-PFT that emerged from this study are, in essence, an indirect condemnation of the way that the FitnessGram was implemented in California for decades. Specifically, the California mandate required public schools to conduct SB-PFT once each year in grades 5, 7, and 9, which contradicts a strong recommendation that emerged from this study; namely, that students should be tested at least twice to provide information about improvement over time.

We note that care should be taken in sharing the recommendation that fitness testing be used to evaluate

individual student improvements in fitness over time. While many participants in this study acknowledged that fitness testing could be used to support goal setting, and might lead to improved performance over time, research shows that teachers rarely create opportunities for students to leverage the SB-PFT results into an individualized fitness plan (Eastham, 2018; Mercier et al., 2016). The point here is that successfully implementing the recommendation to assess fitness multiple times and using the results to examine improvement over time requires assuring teachers’ pedagogical content knowledge of how to meaningfully engage students in fitness education work. We suggest that more research into PE teacher education and professional learning opportunities may offer insights into how to build on fitness testing in a truly educative manner (Harte et al., 2024).

Among the benefits of fitness testing that emerged from this study was the potential for using the data to advocate for resources for PE. The underlying theory is that having in place a regular assessment of student performance that provides a metric of PE efficacy will afford evaluation of PE programming and policies at the class, school, or district level. As effectively pointed out by Bailey et al. (2009), however, what metric will in fact serve as a meaningful accountability indicator depends on the theory of change that drives the outcomes of interest. Specifically, measures of fitness may be more relevant to long-term outcomes such as cardiovascular disease, while measures of PA may be more relevant to short-term outcomes such as affect and cognition. Moreover, student performance on the SB-PFT does not provide an assessment of whether students have met the learning goals stated within the PE standards. Thus, whether SB-PFT and/or PA monitoring will deliver the most utility as an accountability metric is highly dependent on the benefits that are of primary focus.

The questions asked of school staff regarding their opinions about using wearable activity monitors to assess PA in schools were specifically framed around the strategy of using activity monitoring for a set period (7 days) to obtain a snapshot of habitual activity patterns, analogous to the snapshot of physical fitness that is obtained with the FitnessGram. This approach is distinct from using wearable monitors as an intervention tool, which requires students to wear the devices continuously for extended periods of time. There has been considerable research on the efficacy of various digital technologies to facilitate healthy lifestyle behaviors, and the evidence suggests that these healthy lifestyle technologies can provide short-term positive behavior changes (Yang et al., 2023). In the present

study, we were not asking about these kinds of interventions, in which students interact with the wearable devices on an ongoing basis. Rather, we sought to understand what school staff thought and how they felt about the concept of using wearable activity monitors as a periodic assessment of student activity levels.

As noted above, the overall tenor of the opinions regarding using activity monitoring in schools was quite positive, primarily because the students would have access to immediate and personalized information about their activity levels, which could open the door to conversations about healthy lifestyle behaviors. The expectation that direct and timely behavioral feedback might lead to productive learning experiences for students fits well within the existing literature on the role of feedback as a component of the teaching curriculum (Malecka et al., 2022). It is important to recognize, however, that students are unlikely to possess fully developed skills in processing feedback, and that realizing the potential impact of activity monitors in the PE context will require creating the appropriate learning context (Evans, 2013).

The expectation among study participants was that students would enjoy wearing the activity monitors because they are already inclined toward technology. This opinion is consistent with the findings of a recent review which reported that wearable monitors were acceptable to children and adolescents and that using them with youth was feasible (Creaser et al., 2021). In addition, the potential to gamify the experience and link students into social networks were both noted as appealing features and could contribute to the acceptability of the technology.

There has been some research to date investigating PE teachers' readiness to integrate technology into their teaching practices, though the majority of this work has focused on using digital technology as an intervention, not as an assessment tool (Jastrow et al., 2022; Keating et al., 2020). One qualitative survey study of over 1,000 PE teachers in the United Kingdom found that most school staff (82%) had never implemented wearables in the school setting (Creaser et al., 2022). Interestingly, among the teachers who had experience using wearable activity monitors in schools, 91% were willing to use them in the future, whereas among those who did not have experience using wearables in the school setting 70% (still a majority) were willing to use them in the future. The concerns that were raised were similar to those that emerged in the present study, including fears that the students would break or lose the devices. It is worth noting that employing activity monitors for a relatively short period (e.g., 7 days) as an assessment tool is a very different proposition from using activity

monitors as an ongoing intervention. In the former case, students are much less likely to break or lose the device.

As for recommendations regarding how to incorporate PA monitoring into PE, the most frequently provided suggestion in this study was to engage the students in reflection around the data. The use of the word "reflection" in an educational context has been explained as "examining past experiences to understand and change present and future practices" (Attard, 2007, p. 155) and it is a common component of PE teachers' education and training (Standal & Moe, 2013). The emphasis on reflection in this study is consistent with the recommendation that there should be learning activities built around the data. It has been argued persuasively that encouraging youth to adopt a physically active lifestyle can most effectively be accomplished through teaching them self-management skills including self-monitoring, self-evaluation, and self-reinforcement (Brown, 2023; Creaser et al., 2022); specifically, "the rationale for engaging with self-management skills is that individuals that monitor their PA level and use goals to guide their participation are more likely to adopt and pursue a physically active lifestyle" (p. 6). It has also been posited that effective PE classes are those that cultivate meaning, mindfulness, and motivation, in part by "providing opportunities for students to think critically and reflectively and apply knowledge to solve physical activity problems" (Ennis, 2017, p. 248). The process of self-reflection recommended by the school staff in this study offers one strategy for building on the data collected by activity monitors to strengthen competencies in self-evaluation and self-reinforcement and to build meaning, mindfulness, and motivation around PA participation.

It is also worth noting that advocacy for resources in PE (a benefit noted in relation to SB-PFT) might be accomplished with surveillance data derived from activity monitors which, in some ways, may be more intuitive for those in positions of power to assign resources. In other words, being able to describe a student body in terms of what proportion of the students are meeting PA guidelines (i.e., 60 minutes per day of moderate-to-vigorous physical activity) might have even more impact than being able to say what proportion of the students are in the "Healthy Fitness Zone," which is an abstract concept developed by FitnessGram to afford interpretation of the SB-PFT data. Several of the respondents in this study spoke of the need to consider alternatives to SB-PFT practices in PE. Fitness testing, as a pedagogical and assessment practice, is currently the most common context for teaching about health within a PE class, and often replaces other broader PE activities (Yager et al.,

2023). Based on this study, we affirm the potential value of regular assessments in PE while proposing activity monitoring as an alternative and/or complementary strategy for PE-based assessments.

Limitations

This study engaged a small sample of school staff from one county in Southern California, so caution should be taken with generalizing these findings to other geographical regions and/or other contexts (e.g., private schools and neighborhoods with high socioeconomic status). We did find that we reached saturation at the end of our data collection, meaning that no new themes were emerging, which suggests that our findings may accurately reflect the opinions of school staff in Orange County. One possible bias affecting this study, however, is that all the participants in this study had considerable experience with conducting and/or supervising fitness testing in PE, thus giving them ample opportunity to form strong opinions about this approach to assessment. The extent to which this experience has informed their opinions can be seen in the many recommendations for improving the implementation of SB-PFT. In contrast, experiences utilizing wearable monitors to assess PA were mostly recent and idiosyncratic and were based more on respondents' beliefs about how students would respond, rather than observations of how students actually responded to activity monitoring. A more rigorous comparison of the two approaches would give PE teachers an opportunity to use activity monitors to assess PA in the school setting (appropriately resourced and embedded in the class curriculum) and then invite feedback on the experience.

We caution against generalizing these findings to programs or interventions using wearable activity monitors as a behavior change strategy. Unlike the current study, in which respondents were asked to consider the use of activity monitors as an assessment tool, studies that have evaluated wearable monitors as an intervention tool have focused on the impact of wearable monitors on student PA over extended periods of time. For example, a study of adolescents in Melbourne, Australia (Ridgers et al., 2018) found that when students were asked to wear a Fitbit Flex for 6 weeks adherence dropped over time. The approach of using continuous activity monitoring as a behavior change strategy is quite different from that explored in the present study, which specified that students would be asked to wear the monitor for 7 days.

Conclusions

Our study adds to the existing literature on school-based fitness testing in several ways. Importantly, our data

show that school personnel experienced with implementing SB-PFT perceive that it has potential value for contributing to students' motivation for being physically active but acknowledge that there may be fewer benefits for students who are not already active, involved in athletics, or inclined to competition. Moreover, the experiences that study participants had with SB-PFT implementation led them to identify specific recommended practices that are inconsistently followed (i.e., standardization, opportunities to practice, and multiple testing occasions across the school year). In contrast, wearable activity monitors were uniformly perceived as having potential for motivating all students to become more active. The advantages of activity monitoring that emerged in this study included immediate, real-time feedback, the personalized nature of the data, the ability to extend impact to the family, and the intrinsic appeal of digital technology among students. Future research should examine whether wearable activity monitoring, either alone or in combination with SB-PFT implemented using best practices, might be an effective PE-based assessment that would motivate all students, regardless of activity history, to meet PA guidelines.

Notes

1. REDCap is a secure, web-based software platform designed to support data capture for research studies.
2. The governing board of a school district or the office of the county superintendent of schools of a county may grant exemption to a pupil only if the requirements set forth in EC Section 51 241(b) are met, including the consent of the individual pupil. The district is required to offer courses in PE to those students who do not qualify for, or consent to, an exemption (EC sections 51 222, 51 241(a), 51 241(c), 51 242, 51 246, 52 316).

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Data availability statement

Data are available from the authors upon request.

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