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Critical Evaluation of the Case for Pausing California's School-based Fitness Testing

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Objectives: A literature review was undertaken to evaluate the evidence for an association between school-based fitness testing and bullying, weight-based teasing (WBT), and/or gender discrimination. **Methods:** A search of the peer-reviewed literature using PubMed, ERIC and GOOGLE Scholar was conducted to identify articles related to school-based physical fitness testing (K-12) on the one hand and bullying, WBT and/or gender discrimination on the other. **Results**: Twelve studies of the impact of school-based physical fitness testing (PFT) on bullying and WBT were identified. These studies do not support the assertion that PFT places students at elevated risk for bullying and/or WBT as compared to other school settings. There is a dearth of studies investigating an association between PFT and gender discrimination. **Conclusions**: The concerns about PFT as a widespread cause of bullying and WBT are not supported by the evidence. It is likely that school climate is a stronger determinant overall of these negative student interactions and that more rigorous teacher training would ameliorate student concerns about fitness testing. Nevertheless, more rigorous research is warranted to determine with confidence that PFT does not elevate students' risks for bullying and WBT and to examine the risks for students with non-binary gender. **Key Words:** physical fitness testing, bullying, weight-based teasing, gender discrimination, school-based

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Epidemiologic data consistently indicate that most United States youth live a physically inactive lifestyle that places them at elevated health risk both during their youth as well as long into their adult years.

The most recent data from the Youth Risk Behavior Surveillance System[1] show that fewer than half (ie, 46.5%) of high school students met recommended guidelines, which call for youth to engage in at least 60 minutes per day of moderate-to-vigorous physical activity.[2] There are many reasons why these low rates of activity should trigger alarm, including the very strong evidence that physical activity is protective against the development of type 2 diabetes,[3-5] promising evidence that higher levels of physical activity are associated with higher executive function and academic achievement,[6-8] and the increased risk for chronic disease, (heart disease, hypertension, obesity, certain cancers) that is associated with physical inactivity.[9,10]

Schools offer an appealing setting for promoting youth physical activity. Schools provide ready access to youth as well as an educational context within which youth can receive programming that will both afford them the opportunity to be active in their formative years and also instill in them the skills and knowledge to remain active throughout their adult lives. Schools have been previously identified as promising and effective settings for promoting youth physical activity.[11-13]

Among the strategies recommended for leveraging schools to promote youth physical activity is the regular administration of physical fitness testing (PFT), typically comprised of assessments of body composition (eg, Body Mass Index), cardiorespiratory endurance (eg, a progressive shuttle run or timed run), and strength (eg, grip strength or pushups).[14] School-based PFT has a long history, with the first national fitness test being developed in 1958.[15] Originally motivated by concerns about military readiness, PFT has more recently been encouraged as a means of monitoring population health,[16,17] and has been deployed to illustrate disparities in fitness across socioeconomic status and/or ethnicity.[18-20] Large-scale PFT also has the potential to inform policy, though evidence of such utilization of the data is limited.[17] School-based PFT is often promoted as a means of educating students about their health and of motivating increased physical activity.[14,21,22] Whether school-based PFT is in fact an effective strategy for addressing widespread inactivity among youth has been vigorously debated in both the academic and public policy spheres.[15,23,24]

Those who argue in favor of continuing to deploy school-based PFT contend that it is imperative to monitor the epidemiology of youth fitness because of the very robust evidence regarding the beneficial health aspects of fitness and the importance of attaching some measure of accountability to physical education (PE) programs.[17,25] Moreover, in the absence of school-level data, disparities in youth fitness across school districts, communities, and states may go un-noticed and therefore unaddressed. In a perhaps unique example of the data from PFT being used to inform policy, reporting of fitness survey results led to statewide funding to pay for licensed PE teachers in California elementary schools.[17] Proponents of school-based PFT also argue that it has the potential to motivate youth to engage in healthful levels of activity.[26] However, there are few studies that have tested this hypothesis, and some evidence that fitness testing is not effective in promoting behavior change.[27]

There are those who argue that school-based PFT has largely missed the mark in accomplishing its putative goals;[28-30] a failure that is often attributed to poor implementation of the fitness testing protocol.[31,32] A concrete example of this dynamic is a report recommending modifications to the mandatory school-based Body Mass Index screening implemented in Massachusetts,[33] which noted that concerns regarding student bullying were likely related to procedures that were insufficiently protective of students' privacy and confidentiality. An oft-quoted summary of the potential negative impact of PFT on students is that "current programs of field testing of school children are actually antithetical to the goal of promoting physical activity in children. Such tests are demeaning, embarrassing, and uncomfortable to those particular children we are most concerned about- the sedentary lower 10%."[28] More recent criticisms of PFT have raised concerns about whether it carries a risk of exposing students to bullying, weight-based teasing, and/or discrimination against students with non-binary gender. These last three concerns were cited by California's Governor, Gavin Newsom, in a call for a pause on mandatory statewide school-based PFT which he issued in 2020.[34,35] To provide context for these concerns, a summary of the literature related to the health consequences of school-based bullying, weight-based teasing, and gender discrimination is presented below.

Bullying

The Centers for Disease Control and Prevention defines bullying as "any unwanted aggressive behavior(s) by another youth or group of youths who are not siblings or current dating partners that involves an observed or perceived power imbalance and is repeated multiple times or is highly likely to be repeated."[36] Bullying can happen in many forms including physical, verbal, or relational/social. Based on the 2017 School Crime Supplement,[37] 20% of students ages 12-18 experienced bullying during the school year.

Association between bullying and negative health outcomes. A large body of research supports a negative association between bullying and both mental and physical health.[38,39] Among the more rigorous studies on this topic was a prospective study in the Netherlands that followed 1,118 nine to eleven-year-olds for six months and found a reciprocal association between bullying and psychosocial/psychosomatic symptoms.[40] Strong evidence also was provided by a prospective, population-based study of 1,420 nine to sixteen-year-olds in Western North Carolina, which found that victims of childhood bullying were at increased risk for anxiety disorders, depressive disorders, and panic attacks in adulthood, after controlling for family hardships and childhood psychiatric disorders.[41]

Association between bullying and physical education (PE). The possibility that PE may be a setting that places students at risk for bullying has been raised repeatedly in the popular press,[42,43] and certainly bullying does occur sometimes to some students in PE;[44-46] yet evidence that PE places students at elevated risk for bullying compared to other settings is weak. In 3 large cross-sectional self-report surveys, PE or gym (where PE typically takes place) was identified as a setting where bullying occurs; yet none of these studies demonstrated that bullying is more prevalent during PE or in the gym as compared to other school settings. For example, a survey of 15,185 students (grades 4-12) in a diverse Maryland public school district[44] found that PE was not a particularly high-risk setting. Twenty percent of middle school students reported being bullied during PE, but more students reporting being bullied in classrooms (29%), hallways/lockers (29%) and the cafeteria (23%).

Similar findings emerged from a survey of 11,152 students from 65 schools in Canada[46] and a survey of 10,668 middle school students from 20 diverse middle schools in New Jersey and New York.[45] Thus, these studies suggest that bullying is no more likely to occur in PE as compared to other school settings.

Body Shaming and Weight-Based Teasing (WBT)

Another concern related to PFT is body shaming, which is when someone mocks or criticizes a person for a supposed body imperfection.[47] A form of body shaming is weight-based teasing (WBT).[48,49] The prevalence of WBT in the US has not been determined with a nationally representative sample, but regional studies of US youth have found the prevalence of WBT ranges from 17.3% to 43%.[48,50-52]

Association between WBT and negative health outcomes. WBT is associated with psychosomatic symptoms[53] and poor psychological outcomes including anxiety, depressive symptoms, low self-esteem and self-efficacy.[50,51,54-56] Other negative health outcomes associated with WBT include lower self-concept of aerobic fitness, strength, and flexibility,[51] disordered eating, and increased BMI.[48,49,54,57] There is also some evidence that WBT during physical activity is significantly associated with reduced sports enjoyment, reduced perceived activity compared with peers, and reduced mild-intensity physical activity.[58] Overall, the evidence suggests that WBT affects many aspects of mental, emotional, and physical health.

Association between WBT and physical education (PE). PE classes may offer an opportunity for students to experience WBT. Interviews with students and teachers identified perceived differences, such as body size, as the catalyst for most instances of bullying during PE.[59] In a cross-sectional study of 1,555 high school students from central Connecticut, approximately 41% of the participants identified being overweight as the primary reason for being victimized and 85% identified WBT occurring among students during physical activity, such as gym class.[60] These data suggest that PE could be a setting that places students at risk for WBT.

Gender-based Discrimination

In addition to the concerns about bullying and WBT during PFT, concerns have been expressed about students having to declare their gender as part of the assessment.[35,61,62] In society at large, there is a growing awareness and acceptance of gender identities other than the binary options of male and female, including transgender, non-binary, and gender nonconforming. In 2019, California put into effect Senate Bill 179 which created a gender category for non-binary that can be used on birth certificates, identity cards, drivers' licenses, and gender-change court orders.[63] In contrast, the norms used to interpret the performance data from PFT are based on binary gender categories, leading some to question whether non-binary gendered youth may be placed in an awkward or uncomfortable position if required to declare a binary gender identity.

Public recognition and acceptance of gender fluidity is a relatively young phenomenon. Research methodology is struggling to catch up and provide useful data. Specifically, the recent expansion of categories used to describe gender identities has posed a methodological challenge for researchers when trying to ascertain the prevalence of people who identify outside the binary gender system. One recent study of Minnesota public school students in 9th and 11th grade (N = 80,929) assessed gender identity by asking "Do you consider yourself transgender, genderqueer, genderfluid, or unsure about your gender identity." Those who answered yes to this question comprised 2.7% of respondents.[64] Another approach utilized adult data from the CDC's Behavioral Risk Factor Surveillance System, to estimate prevalence among youth. This survey asked "Are you transgender?" and yielded a more conservative estimate of 0.7% of youth ages 13 to 17 identifying as transgender.[65] Debate continues regarding the best methodology for assessing prevalence of non-binary gender identities among youth, so caution should be exercised in interpreting currently available data. Moreover, the prevalence of non-binary gender individuals appears to be increasing over time,[66] though how much of this trend is explained by changing societal attitudes, new research methodologies, or an actual increase in prevalence is unknown at this juncture.

Association between gender discrimination and negative health outcomes. Transgender and gender non-conforming (TGNC) youth face discrimination and stigma that contribute to mental health problems.[67]

TGNC youth have an increased risk for anxiety, attention deficit disorder,[68] suicidal ideation,[69] and depression.[70] TGNC youth also experience a significantly higher prevalence of bullying and harassment than cisgender youth.[69,71,72]

Association between gender discrimination and physical education (PE). More than 80% of transgender middle and high school students in the Preventing School Harassment Survey (N = 2,260) reported hearing negative comments based on gender presentation by other students [73] and 44.6% of students in the 2017 National School Climate Survey felt unsafe at school because of their gender expression.[74] PE or gym class is a setting within school in which TGNC students may feel particularly unsafe due to the gendered aspects of PE, such as locker rooms, different gender expectations, and division of activities based on gender.[75] Based on data from the 2017 National School Climate Survey, 64.1% of transgender students and 41.6% of all genderqueer and other non-binary students avoided PE or gym class because they felt unsafe or uncomfortable. This is significantly higher than their cisgender peers (28.6%),[74] suggesting that PE is an environment that is not supportive of gender nonconformity.

Clearly, bullying, WBT, and gender discrimination have negative impacts on physical and mental health, and if school-based PFT places students at elevated risk for these types of interactions this situation should be decisively addressed. The California Governor's call for pausing school-based PFT has created an opportune moment for evaluating the evidence of unintended negative consequences of school-based PFT. The purpose of this review was to summarize the available evidence that school-based PFT results in bullying, WBT, and/or gender-based discrimination.

METHODS

A search for peer-reviewed publications was conducted using PubMed. ERIC and Google Scholar were also searched but yielded no unique results. Search terms used included terms related to fitness testing (FITNESSGRAM, Timed Mile Run, Physical Fitness Test, Fitness Testing, Body Mass Index, BMI, BMI

Screening) paired with at least one term related to the topics of interest (Bullying, Weight Discrimination, Body Shaming, Fat Shaming, Weight-based Teasing, Gender non-conforming, Non-binary, Transgender, Gender bias). If the key word search yielded more than 100 results, the search was refined using the title and abstract only search method in PubMed. Abstracts were screened for articles that were relevant to school-based PFT and focused on students in grades K-12. Backward and forward reference tracing supplemented the key-word search. Only English-language articles were included. Figure 1 shows a flow chart of the search process that followed the PRISMA recommendations.[76]

<INSERT FIGURE ONE ABOUT HERE>

RESULTS

Association Between Bullying and Physical Fitness Testing

Weak support for an association between PFT and bullying comes from three publications identified by the literature search (see Table One). Two school-based studies were conducted in Texas, where PFT has been mandated, and one survey of pediatricians' perceptions of mandatory school-based BMI screening was carried out in Massachusetts. One of the Texas studies reported findings from a single focus group of 9 PE teachers. Three of the nine teachers reported witnessing students teasing other students during PFT.[77] This study is of limited utility and generalizability, given the small sample size and the lack of information related to prevalence or severity of the teacher-reported events. Somewhat stronger evidence of an association between PFT and negative peer interactions comes from a large survey of PE teachers in Texas who implemented the mandatory fitness testing. Of the 1,505 teachers surveyed, 26.6% reported negative consequences associated with fitness testing.[78] While indicative that some PE teachers perceive PFT to be a setting within which bullying does occur, the conclusions that can be drawn from these two Texas studies are limited given that they are not based on students' own reports and do not place the teachers' perceptions within the context of how frequently bullying or teasing occurs in the school overall. In the absence of such information, it is not possible to verify

whether PFT places students at elevated risk for bullying in the school environment. Finally, 11% of 286 pediatricians surveyed in Massachusetts [79] reported that they had delivered counseling to parents about bullying related to school-based BMI screening. Given the very low response rate on this survey (18.6%) and the small number of pediatricians who mentioned bullying as an issue raised by parents in the clinical setting, this study provides only a weak indication that school-based PFT may be associated with bullying.

<INSERT TABLE 1 ABOUT HERE>

Association Between Weight-based Teasing (WBT) and Physical Fitness Testing (PFT)

Our literature search yielded 9 publications relevant to WBT and PFT: two literature reviews; one legislative review; and six empirical studies (see Table One). The component of PFT that is typically identified as the culprit for WBT is the assessment of body mass index (BMI), a weight-to-height ratio used to distinguish weight categories.[80] The putative link between BMI assessments and WBT has been called out repeatedly in public forums.[34,35,81-84] Yet the evidence for an association between BMI screening and WBT is sparse. Ikeda et al.,[81] in a comprehensive review of policies and research regarding BMI screening in schools, mentioned concern for labeling students as 'fat' and referenced two studies as supporting evidence; a retrospective study of female college students reflecting on their experiences during youth,[85] and a cross-sectional study comparing overweight youth's experience with teasing to non-overweight peers.[86] Neither of these studies in fact offers evidence that the BMI assessment is associated with WBT. Similarly, a more recent review by Soto et al. [82] alluded to a concern about teasing in relation to the BMI assessment and provided a single supporting citation of focus group data from one school in Minnesota in which participants were asked to rate the problem of teasing about weight at the school. Students, staff, and parents reported WBT was a prominent issue at their school,[87] but the association with BMI assessment was not evaluated. The concern about WBT being related to BMI screening was again raised in a legislative review arguing against mandatory BMI reporting laws.[88] Despite arguing that BMI reporting puts children at risk for bullying and teasing, the only supporting evidence cited

was a study that found that children who are overweight/obese experience more bullying compared to normal weight children.[89] In sum, the studies referenced in the various reviews on this topic do not provide evidence that PFT is associated with WBT.

Two studies were found that specifically assessed WBT in relationship with BMI screening, and the results of these studies further illustrate that BMI assessments do not appear to be associated with WBT. Grimmett et al. [83] conducted a descriptive, longitudinal study of 358 children (6-11 years old) from 6 London schools and their parents (N = 287) to examine the potential distress experienced by children in a weight screening program. The children's height and weight were measured in a screened area at school by trained researchers. Parents and students completed questionnaires six weeks prior and four weeks after results were sent home. The questionnaire responses provided no evidence that increases in WBT occurred following the BMI assessment. It should be noted that in this study students' height and weight were recorded in a screened area to ensure the student's privacy. Such a procedure is consistent with recommended best practices, but may not be widely implemented,[77] so the findings of this study may not be widely generalizable.

In a rigorous test of the hypothesis that school-based BMI screening is associated with adverse students outcomes, Madsen et al.[90] conducted a randomized clinical trial in which 79 elementary and middle schools were randomly assigned to either undergo BMI screening or have no screening for three successive years. Students completed a survey each fall and then again 6-9 months after the BMI assessments. A peer weight-based teasing index was included on each survey. Among the 14,318 students studied, WBT did not increase as a function of the BMI assessment. In sum, the available evidence does not provide evidence for an association between school-based PFT and WBT.

Association Between Gender Discrimination and Physical Fitness Testing.

No peer-reviewed publications related to gender bias and PFT were identified through our literature search. Indirect evidence related to the potential association is reviewed in the Discussion section, below.

DISCUSSION

The purpose of this review was to examine the available evidence for the assertion that school-based fitness testing places students at risk for bullying, WBT and/or gender discrimination. This assertion has been voiced repeatedly in the public sphere and is the foundation for a recent proposal by the Governor of California to place a hold on PFT throughout the state.[62] In pursuit of the evidence, we examined the peer-reviewed literature and found little empirical support for an association between school-based PFT and bullying, WBT, or gender discrimination. Whereas a lack of evidence does not demonstrate the absence of an association between PFT and negative student outcomes, it does suggest that the available data are insufficient to justify termination of a statewide fitness testing mandate, given the valuable role that these data play in monitoring youth fitness on a community and population level. As discussed below, actions that can be recommended based on the available evidence include conducting rigorous research to confirm or refute the putative link between fitness testing and negative student impact, making concerted efforts to reduce the occurrence of school-based bullying and WBT by nurturing a positive school climate, establishing universal training and policies to support appropriate execution of fitness testing when implemented, and pursuing investigation of alternative approaches to assess student health.

Only three peer-reviewed studies addressing bullying and PFT emerged in our literature search. These studies fail to provide persuasive evidence to suggest that PFT places students at elevated risk for bullying as compared to other school situations. The broader literature on school-based bullying suggests that school climate is the dominant consideration influencing the frequency of bullying,[91,92] with factors such as respect for diversity, school engagement, and social support from adults/students setting the stage for reduced incidence of bullying.

Several decades of research has provided compelling evidence that a positive school climate is positively associated with students' physical and mental well-being and negatively associated with bullying.[93]

A positive school climate has been defined by the National School Climate Council, in part, as one that "includes norms, values, and expectations that support people feeling socially, emotionally and physically safe."[94] Bullying has been shown to be more likely to occur when the school climate is unhealthy,[92] and bullying can be decreased through schoolwide interventions designed to improve the school climate.[95] It is worth noting that the components of a positive school climate closely mirror the components of a PE program that follows established best practices. Major components of a positive school climate include feeling safe, connected, and engaged.[96] These components align closely with the standards set forth for PE by the National Board for Professional Teaching Standards (NBPTS),[97] which state that: "Accomplished teachers set high expectations and create positive, well-managed classroom environments that engage all students within a safe and respectful culture of learning (Standard V);" and "Accomplished teachers create inclusive and productive learning environments that are safe, fair, and equitable for all students. They promote healthy social interactions within their schools and communities by teaching students to embrace their uniqueness and respect the diversity of others (Standard VI)."

It is also worth noting that there may be a reciprocal relationship between the overall school climate and the climate within the PE program. A positive school climate is cultivated through "setting clear expectations for behavior, promoting mutual respect, consistently enforcing rules, [and] effectively managing classroom transitions."[98] These principles can be effectively established, modeled, and reinforced in the PE program setting, which has been suggested as an ideal platform for addressing students' social and emotional learning.[99] Conversely, PE teachers who operate within a positive school climate are empowered to address directly and decisively any instances of unsupportive behavior exhibited by students.[100] In the absence of an overall school climate that prohibits bullying and promotes supportive behavior, bullying is more likely to occur across all school settings.

Weight-based teasing is a particular type of bullying that has been repeatedly called out as likely to be a negative outcome of PFT, yet our review of the literature revealed no empirical support for this assertion and some evidence in opposition. Unfortunately, several published peer-reviewed articles have promulgated the assumption that students who are overweight or obese are subject to WBT because of PFT, despite the lack of evidence to demonstrate that such an association exists. In fact, the two prospective studies that investigated the frequency of WBT before and after students underwent the PFT [83,101] found no increase in teasing after the assessments.

Although there is a dearth of evidence that school-based PFT results in WBT, the concern about a link is intuitive, and has been expressed by both students and teachers in qualitative studies.[83,87] Recommendations for best practices in carrying out PFT reflect this concern, and include the suggestion that students should be provided with the opportunity to regularly assess their own fitness (with a trusted partner) in informal testing sessions.[26] The implication here is that fitness testing should be implemented in such a manner that students feel safe, both in terms of the social context and in terms of their readiness for the assessment. A sense of social and emotional safety is another linchpin of a positive school climate,[96] and there is strong evidence to support the efficacy of practices that improve positive peer relationships, positive staff-student relationships, and students' sense of school connectedness and belonging as a means of improving school climate.[98] Thus, the evidence suggests that within a school with a positive school climate the potential for a negative impact of PFT is diminished, and that when PFT is administered using recommended best practices it may contribute to building a positive school climate.

That PFT is often implemented in a way that is inconsistent with recommended best practices has been documented,[77] and may be the underlying reason for widespread concern about the impact of PFT on student well-being. As policymakers and educators continue to wrestle with the question of whether to implement fitness testing in the schools, it is imperative that high-quality studies be conducted to ascertain whether WBT in

fact occurs when the assessments are carried out within a positive school climate and using best practices for test administration. One study relevant to this question surveyed 304 elementary school students who completed a BMI screening at school in a private setting by nurses who had received training in sensitive approaches to height and weight assessment.[102] Ninety-four percent of the students reported that they were "OK" or "Happy" with the experience, suggesting that when implemented using best practices school-based screening is not likely to lead to negative student reactions. The currently available body of evidence is insufficient to determine whether the benefits of the PFT are outweighed by the putative negative consequences.[101,103]

Future studies intended to critically examine the potential link between PFT and negative social interactions should incorporate examination of the experiences of youth with disabilities. Such youth may be especially vulnerable to bullying, especially if they are also obese.[104] Calls for inclusive physical education programs[105,106] point out that students with disabilities tend to score lower on fitness tests compared to youth without disabilities, and that students with disabilities tend to benefit from inclusive physical education programming. Inclusive programming may, however, afford opportunities for students with disabilities to receive unwanted attention during PFT. Thus, best practices for administering PFT among students with disabilities should be identified and incorporated into teacher training.

The third justification used by the Governor of California for wanting to place a hold on PFT revolves around issues of gender identification. Specifically, concerns have been raised that the method for interpreting fitness data requires students to identify as either male or female and thus fails to accommodate students with a non-binary gender. Because the potential for gender identification to play a role in the impact of PFT on youth has only newly come to the fore as a concern, there are no published studies that directly address this issue; yet, the data derived from PFT have been normed against a binary gender categorization, leading to concerns about perceived pressure on youth to identify as male or female.[34,35,62] As stated by one advocate for youth with non-binary gender identities: "If I'm a transgender boy and nobody knows, and then I don't meet the standards of a

boy physically, I'm put in a difficult situation. Either I don't meet the standards and take the according grade or I compromise my privacy and tell my teacher I was born as a girl."[61] In other words, a student may be faced with choosing to identify as male, and therefore be held to a more stringent fitness standard, as males on average have higher fitness than females, or choosing to (mis)identify as female so as to be evaluated in comparison to the fitness standards for females.

Importantly, there are currently no published data that speak to the prevalence or severity of pressure on students to identify their gender during PFT. Data relevant to the prevalence of students with non-binary gendered youth are currently unreliable yet seem to suggest that between 1-3% of youth may be uncomfortable if challenged to identify as male or female for the purposes of fitness evaluation. Consistent with California Senate Bill 179, the California Department of Education has adapted to the expansion of gender identities by recognizing a third gender choice of non-binary, which started in the 2018-2019 administration of school-based PFT.[107] The gender field is left blank on student score reports for students who identify as non-binary and their scores are not scored or reported.[107,108] Whether this approach buffers students who identify as non-binary from potential negative impacts of PFT remains to be demonstrated. More robust information about both the prevalence of non-binary gender identities and how students with non-binary gender experience PFT are needed to describe the scope of the problem and inform possible responses.

Available data suggest that the prevalence of non-binary gender appears to be quite low,[66] but the prevalence of bullying among youth who identify as non-binary gender is quite high,[72] and the consequences can be severe in terms of mental and physical health.[67] Theoretically, a student of non-binary gender could be placed in an uncomfortable position if required to state their gender to conform to the needs of the testing. One line of inquiry that would be informative in the current debate over the role of gender identification in PFT is to determine the extent to which the need for gender designation impacts the transgender student's assessment experience. Quantitatively, certain components of the FITNESSGRAM, the PFT utilized throughout the State of

California and several other states, specify different cut-points for males and females in the determination of whether a student's score falls within the Healthy Fitness Zone (HFZ). Males must typically meet a higher standard to be classified as within the HFZ.[109] It is possible to envision that a transgender male experiencing perceived pressure to meet the HFZ criterion might view the classification according to gender as discriminatory. It is important to note, however, that there are no data currently available to demonstrate the prevalence of such experiences or, indeed, the actual impact of the requirement for gender identification on the transgender student's experience of PFT.

As noted above, research indicates that PFT is frequently implemented in a manner that is inconsistent with established and recommended best practices.[77] The California Physical Fitness Test (PFT) Reference Guide for the 2019-2020 school year [107] lists under each test component tips for correct implementation. However, these tips rarely address ways to minimize adverse reactions by students. Appropriate and inappropriate uses and administration of PFT have been described, however, in a number of academic publications.[26,110-112] These publications highlight important aspects for PE teachers to consider when implementing PFT, such as: "respect students privacy wishes. Some students become embarrassed with their mile times. Therefore, teachers should consider staggering start times so that no one knows what lap someone else is on."[110] Another set of recommendations about the appropriate and inappropriate practices in PFT implementation states that "With physical fitness testing, the actual testing process is often quite public. Appropriate protocol can be used to assure as much privacy as possible (eg, separation of testing stations, screens to avoid observation of measurements, especially body composition measures)."[111] Significantly, these published recommendations suggest that PFT should be part of a year-long curriculum [21,112], so that it serves an educational function and is embedded within a coherent series of lesson plans that provide context for fitness testing. The documented shortfall in PE teachers' utilization of available training materials and implementation of best practices for PFT [77] is testament to the need for better training targeted toward putting into practice widely recommended strategies for minimizing potential negative impact of PFT.

It is important to note that PFT can be used to serve two independent goals: surveillance and screening. To serve the first goal, surveillance, it is not necessary for students to be informed as to their performance or relative ranking on any of the assessments. Rather, the data can be anonymized and submitted to a centralized database and made available to support setting of policy, distribution of resources, and research. The State of California has posted anonymized and aggregated school fitness data to a publicly accessible website,[113] which has enabled a number of policy-relevant publications. One such publication [114] used the California PFT data in combination with Census data to demonstrate an association between neighborhood poverty and risk for overweight, and another [115] analyzed the California PFT data to show disparities in risk for overweight by race/ethnicity and sex. The data collected by the Texas Youth Evaluation Project,[116] in which PFT was implemented among more than 2.6 million students in Texas, were used to highlight the importance of PE teacher training and professional development, which were associated with higher rates of students meeting fitness goals.[78] There is a strong rationale, therefore, supporting large-scale implementation of PFT as a policy-relevant strategy for improving population health and reducing health disparities.

The second goal that may be served by the PFT is to identify individuals most at risk for health problems associated with poor fitness.[82] There are typically certain assumptions made about how individual test results will be utilized and the value that they serve. For example, in a report from the Institute of Medicine released by the Committee on Physical Activity and Physical Education in the School Environment,[117] the text states that PFT "can provide both teacher and student with information about the student's current fitness level relative to a criterion referenced standard, yield valid information that can serve as the basis for developing a personal fitness or exercise program based on current fitness levels, motivate students to do better to achieve a minimum standard of health-related fitness where deficiencies exist, and possibly assist in the identification of potential future health problems (p. 210)." Yet there is little evidence to suggest that any of these potential outcomes of fitness assessments occur on a widespread basis. That is, there are no data to support the expectation that students typically receive constructive fitness testing feedback nor that such information

motivates students to "do better."[118] In fact, there is evidence that teachers rarely use fitness test results to craft personal fitness plans for students and that providing students who are low in fitness with a percentile-based categorization of their assessment results may reduce their intrinsic motivation for physical activity.[119,120] Moreover, accepted behavior change theory would suggest that merely informing students of their fitness level relative to a standard is a poor strategy to improve fitness, since knowledge of one's risk status is seldom sufficient to motivate a change in behavior.[121]

Fitness testing as a means of encouraging individual behavior change has been critiqued on the grounds that "it focuses attention on the outcome or product rather than the underlying behavior that is being promoted (physical activity)."[122] This distinction is important for two reasons. First, students may score relatively high on tests of fitness without being regularly physically active, as up to 60% of fitness may be genetically determined.[123] Since physical activity is associated with many health and psychosocial benefits independent of physical fitness,[124-127] relying solely on measures of fitness to provide students with information to inform their lifestyle choices could lead some youth to conclude erroneously that their sedentary behavior is not a cause for concern. A second reason it is important to distinguish between fitness assessment and physical activity assessment is that any recommendations must ultimately be communicated to youth in terms of suggested changes in physical activity. That is, to improve fitness an increase in physical activity is required, and meaningful guidance will be more effective if rooted in information about physical activity levels.

Although the potential utility of physical activity assessment as a component of PE in schools has long been recognized, it has often been assumed to be low in feasibility owing to cost, logistics, and/or lack of reliability of the assessment tools. In the last decade, however, the rapid acceleration in acceptability, ubiquity, and reliability of ambulatory activity monitors has largely removed these barriers to school-based physical activity monitoring. The evidence suggests that consumer-oriented activity monitors are acceptable, even appealing, to youth,[128-130] and that the data are of sufficient quality to inform behavioral recommendations.[131] Moreover, activity monitors largely do away with the concerns about bullying, WBT, and/or gender

discrimination that have been raised in relation to fitness testing. In the current pandemic era, during which many students are not attending school in person and those who are may be asked to maintain physical distance, activity monitoring affords a potential means of remotely evaluating student health. To date, however, activity monitoring has not been widely adopted in the school environment as a method to assess student health, even though there is some evidence to suggest that providing students with data derived from activity monitors may increase their motivation to engage in physical activity.[132-135] Future consideration of the role of PFT in schools, therefore, should include a discussion of the potential for physical activity assessment as a possible alternative strategy for identifying students at elevated health risk, generating data that might be used to highlight disparities in health across demographic and regional groups, and promoting individual behavior change conducive to better health.

IMPLICATIONS FOR HEALTH BEHAVIOR OR POLICY

A goal of Healthy People 2030 is to "improve health, fitness, and quality of life through regular physical activity", which is associated with physical activity objective six to "increase the proportion of adolescents who do enough aerobic physical activity."[136] This objective is inherently compatible with the aims of school-based PFT. However, PFT may also afford an opportunity for adolescents to be discouraged from being physically active if the assessments are implemented improperly. On the basis of this literature review, we offer the following recommendations:

- Rigorous research should investigate the putative association between PFT on the one hand and bullying, WBT and gender discrimination on the other. This research should be designed to compare rates of negative social interactions associated with PFT to those occurring in the school as a whole and to examine the moderating effects of school climate.

- School-based fitness testing, when implemented, should be supported by rigorous teacher training in best practices not only to ensure adherence to the testing protocol but also to create a safe and learning-oriented context for testing.
- In pursuit of the goal of motivating behavior change through providing students with data about themselves, alternatives to PFT, such as physical activity monitoring, should be explored. Behavioral theory would suggest that monitoring the behavior that is amenable to volitional change is more likely to stimulate behavior change as compared to monitoring an outcome of that behavior, such as body composition or cardiorespiratory endurance.

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Human Subjects Approval Statement

This review does not meet the criteria for human subjects research therefore IRB review was not applicable.

Conflict of Interest Disclosure Statement

All authors declare they have no conflicts of interest.

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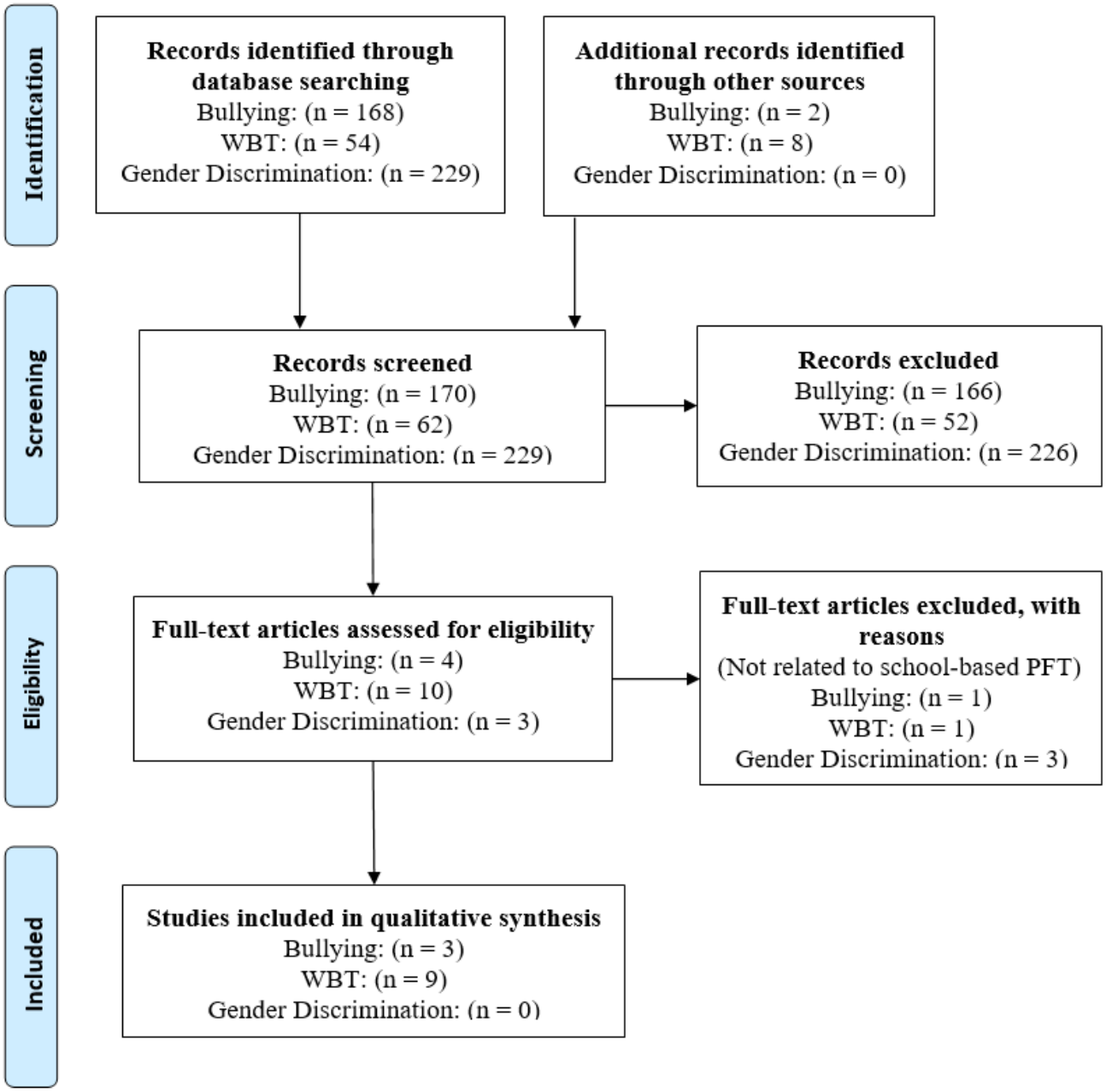
Figures

Figure 1
PRISMA Flow Diagram of Literature Search Process



Tables

Table 1
Identified Peer-reviewed Studies through Literature Search

Study	Target Population	Sample Size	Methodology
Bullying			
Martin et al., 2010. [75]	Secondary physical education teachers from Texas	N = 9	Focus Group
Zhu et al., 2010. [76]	Teachers who participated in Texas Youth Education Project	N = 1,505	Online Self-report survey
Bottino et al., 2016. [79]	Members of the Massachusetts Chapter of the American Academy of Pediatrics	N = 286	Online Self-report survey
Weight-Based Teasing			
Ikeda et al., 2006. [78]	n/a	n/a	Literature Review
Soto et al., 2010. [79]	n/a	n/a	Literature Review
Grimmett et al., 2008. [80]	6–11-year-olds and Parents	N = 358 N = 287	Self-report Survey
Cash, 1995.[85]	Female college students	N = 111	Retrospective Survey
Hayden-Wade et al., 2005. [82]	Overweight and non-overweight children 10-14 years old	N = 70 overweight N = 86 non-overweight	Survey with BMI Assessment
Haines et al., 2007. [83]	Students, staff members, and parents	N = 21 student N = 12 staff members N = 21 parents	Focus Groups and Individual Interviews
Cogan et al., 2008. [85]	n/a	n/a	Legislative Review and Analysis
Janssen et al., 2004. [86]	11–16-year-olds	N = 5,749	Secondary Analysis of Self-report Survey Data
Madsen et al., 2020. [90]	California elementary and middle schools (grades 3-8)	N = 79	Cluster randomized clinical trial