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JROTC as a Substitute for PE: Really?

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Abstract

Purpose—Even though physical education (PE) is an evidence-based strategy for providing and promoting physical activity, alternative programs such as Junior Reserve Officer Training Corps (JROTC) are commonly substituted for PE in many states. The purpose of this study was to compare student physical activity and lesson contexts during high school PE and JROTC sessions.

Method—SOFIT (System for Observing Fitness Instruction Time) was used to assess PE and JROTC sessions (N=38 each) in 4 high schools that provided both programs. Data were analyzed using t-tests, negative binomial regression, and logistic regression.

Results—Students engaged in significantly more moderate to vigorous physical activity during PE than JROTC sessions and they were significantly less sedentary. Significant differences between the two program types were also found among lesson contexts.

Conclusions—PE and JROTC provide substantially different content and contexts and students in them engage in substantially different amounts of moderate to vigorous physical activity. Students in JROTC, and perhaps other alternative programs, are less likely to accrue health-supporting physical activity and engage in fewer opportunities to be physically fit and motorically skilled. Policies and practices for providing substitutions for PE should be carefully examined.

Keywords

Policy; Physical Activity; Physical Education; Course Substitutions

Physical inactivity is receiving growing attention given its documented relationship to a variety of chronic health (Strong et al., 2005) and metabolic challenges (Owen, Healy,

Matthews, & Dunstan, 2010) and the fact that most adults and children do not meet physical activity guidelines (Troiano et al., 2008; USDHHS, 2008). For over two decades, the importance of schools in providing and promoting physical activity has been consistently emphasized (Institute of Medicine, 2013; Pate et al., 2008), but with the reauthorization of the Elementary and Secondary Education Act of 2001, school physical activity programs, including physical education (PE), have instead sustained reduced time and resource allocations (McKenzie & Lounsbury, 2009).

PE is a primary strategy because it (a) is institutionalized as part of the K-12 curriculum and as such, has the potential to reach nearly all students, (b) is the only program where the least active children can experience physical activity at higher intensities, and (c) has the potential to significantly contribute to daily accrual of moderate to vigorous physical activity, increase fitness, develop and improve motor and other generalizable skills. Though PE is a key evidence-based strategy for providing and promoting physical activity (Institute of Medicine, 2013; Ward, 2011) and a goal of Healthy People 2020 (U.S. Department of Health and Human Services, 2010) there are many practice and policy barriers to its effective delivery; thus, its potential to impact health has not been fully realized (McKenzie & Lounsbury, 2009). Among these policy barriers is the pervasive practice of allowing waivers/exemptions and/or substitutions for physical education. This includes allowing alternative programs such as JROTC (Junior Reserve Officer's Reserve Corps), interscholastic sports, marching band, cheerleading, and community sports to substitute for PE enrollment (NASPE, 2012), a practice which has been of great concern to the profession (Abernathy, 1960; NASPE, 2006; Sims, 2011) and public health officials (e.g., Centers for Disease Control and Prevention, 2011) for many years.

The 2012 Shape of the Nation Report, a survey of physical education coordinators in all 50 state education agencies and the District of Columbia indicated that 65% of respondents (33 of 51) reported permitting school districts or schools to allow students to substitute other programs or activities for required PE credit (NASPE, 2012). The most common substitution allowances were for JROTC (18 states), interscholastic sports (18 states), marching band (13 states), and cheerleading (11 states).

The bases or criteria used to determine approved substitutions are unclear, with most states simply listing approved substitutions. One rationale for the appropriateness of substitute programs is that the alternative program provides physical activity at levels similar to those found in PE and provide content that meets state or national PE standards (e.g., Norton, 2009). While physical activity appears to be a common characteristic within all PE course substitutions, we failed to locate any evidence that these alternative programs either provided comparable levels of physical activity and/or delivered content that meets PE standards. Given the critical need for the accrual of moderate to vigorous physical activity and the empirical evidence specific to PE in this regard (Troiano et al., 2008; USDHHS, 2008), the purpose of this study was to compare student physical activity levels and lesson contexts during high school PE and one common PE course substitution, JROTC.

JROTC is a Federal program sponsored by the United States Armed Forces in high schools across the United States. The program, originally created as part of the National Defense Act

of 1916, has as its stated goals “to instill in students in United States secondary educational institutions the values of citizenship, service to the United States, and personal responsibility and a sense of accomplishment” (United States Code, 2011). A target of 3,500 JROTC units exists across the Services (Air Force, Army, Marine Corps, Navy), with programs in approximately 3360 schools in 2007 and plans to expand to 3700 units by Year 2020 (United States Code, 2011; Department of Defense, 2006).

Methods

Setting and Participants

The study was conducted within a large US southwestern urban school district with a student population of nearly 315,000. About 32% of students are white, 13% black, and 42% Hispanic, and over half are eligible for free and reduced price lunch (NCES 2013). Following approval by university and school district review boards (which waived consent from parents and assent from students), we identified 12 high schools in the district that provided both PE and JROTC. From these, we randomly selected 4 schools for inclusion in the study, and within each school we recruited and obtained informed consent from two PE and two JROTC teachers who agreed to participate. In total, there were four male and four female PE teachers; all were specialists with a minimum of 5 years teaching experience. JROTC instructors were seven males and one female; all had met the minimum qualifications for JROTC instruction as required Federally and by the state.

The initial plan was to observe five daily sessions of a randomly selected PE and JROTC classes from each participating teacher for one full week. Two PE and two JROTC lessons were lost due to teacher absences and scheduling disruptions and therefore, a total of 38 PE and 38 JROTC lessons were observed. The observations, made from September through November, 2011, were conducted in the regularly scheduled indoor and outdoor instructional locations for the lessons. PE activities included aerobics, badminton, basketball, bowling, fitness, flag football, and wrestling. JROTC sessions were mainly comprised of military academic time, military drilling, physical training (PT), and uniform inspection.

Observation Instrument and Procedures

Two trained observers used the System for Observing Fitness Instruction Time (SOFIT) to collect data during the lessons. SOFIT uses direct observation to simultaneously record student activity levels and the lesson context. The activity codes have been validated using heart rate monitoring (McKenzie et al., 1991; Rowe et al., 2004) and accelerometry (Scruggs et al., 2003), and the development and protocol for the instrument have been described in numerous papers (e.g., McKenzie, Marshall, Sallis, & Conway, 2000; McKenzie et al., 1991). In the current study trained assessors, paced by 10-second alternating auditory observe/record prompts from an MP3, observed the activity levels of four randomly selected students during entire lessons. As they entered the instructional station, students 5, 10, 15, and 20 were selected for observation, with student number 25 being identified for possible observation if one of the previous four became unavailable during the lesson. Data collectors entered codes 1 to 4 to describe the observed student’s body position (lying down, sitting,

standing, walking), and code 5 (vigorous) to identify when the student was expending more energy than that of normal walking. Simultaneously, the observers coded the lesson context into one of six categories to represent how the lesson content was being delivered: management, knowledge, fitness, skill practice, game play, or free play. In total, 12,282 - 20 second intervals (6,106 PE intervals and 6,175 JROTC intervals) were observed during the 76 lessons. This equates to 4094 minutes or 68 hours of lesson time (PE = 2035 minutes or 33.9 hours; JROTC = 2057 minutes or 34.3 hours).

The SOFIT observers were experienced and had previously participated in a standardized SOFIT training that included assessing 'gold standard' video segments and live practice sessions. Actual data collection began only after interobserver agreement (IOA = $[\# \text{agreements} / (\# \text{agreements} + \# \text{disagreements}) * 100]$ exceeded 85% on the two major categories. During field reliability checks, they independently scored 10% of the PE lessons and 25% of JROTC lessons while being paced by the same MP3. For PE, IOA was found to be 93% for physical activity and 99% for lesson context and IOAs were 96% for both physical activity and lesson context for JROTC.

Data Analysis

The lesson (N=76) was the unit of analysis for the study and lesson level outcomes were the percentages of observed lesson time that students spent engaged in various activities. Two-tailed independent samples t-tests were used to examine differences between PE and JROTC lessons for percentage of class time spent in physical activity and lesson context categories. Given that some of the outcomes observed were not normally distributed, negative binomial models were used to analyze the rate (incidence density ratio) of student physical activity and lesson context variables (minutes for each category/total observed minutes; Gardner, Mulvey & Shaw, 1995). Finally, binary logistic regression models were used to analyze the odds of lessons meeting the recommendation of at least 50% time in moderate to vigorous physical activity.

Results

Table 1 shows that students engaged in significantly more moderate to vigorous physical activity during PE lessons than JROTC lessons (Mean % 61 vs. 23; $t(74) = -8.64$; $p < .001$; $d = 1.98$). Students in PE spent significantly more time walking and engaging in vigorous activities while those in JROTC spent significantly more time sitting and standing. Significantly more PE lessons met the guideline of students engaging in moderate to vigorous physical activity at least 50% of class time (Mean % 76 vs. 8; $t(63) = -8.27$; $p < .001$; $d = 1.92$).

Relative to how class was conducted, PE teachers allocated significantly more class time for fitness and game play and teachers of JROTC lessons allocated significantly more time for knowledge and skill development. Knowledge time during PE (100%) focused on physical fitness, motor skill development, and game strategy concepts, while most knowledge time (83%) in JROTC focused on drill, inspections, and military history and strategies.

Results of negative binomial models (Table 2) confirm that moderate to vigorous physical activity, including walking and vigorous activity, was significantly greater during PE than JROTC. PE lessons provided moderate to vigorous physical activity at a rate almost three times higher than JROTC lessons while sedentary behavior time was almost half that of JROTC. PE lessons provided a significantly greater proportion of time in game play than JROTC lessons, but less to knowledge and skill development.

Results of binary logistic regression models indicated that compared with JROTC lessons, PE lessons had significantly greater odds of meeting the recommendation of students spending at least 50% of class time in moderate to vigorous physical activity (OR=37.59; $p<.001$; 95% CI: 9.31-151.86).

Discussion

JROTC and other programs purported to provide similar amounts of moderate to vigorous physical activity as PE are commonly allowed to substitute for PE credit (NASPE, 2012). The results of this study showed, however, that students enrolled in JROTC engaged in significantly less moderate and vigorous physical activity than students in PE and they were significantly more sedentary. JROTC provided students “physical training” on only one day per week; on other days, lessons were delivered in the classroom. These data represent a “typical” week of program delivery and hence, clearly show that students enrolled in JROTC and PE did not receive comparable levels of physical activity. These results, though limited to one week of observation, counter the notion that JROTC is an allowable substitution for PE because it provides similar amounts of physical activity.

From a public health point of view, it is concerning just how few JROTC lessons met the Institute of Medicine (2013) recommendation of engaging students in moderate to vigorous physical activity at least 50% of class time. PE lessons had 37 times greater odds of meeting this recommendation. Meanwhile, because they are allowed to substitute alternative programs for required credit in PE, many students do not enroll in it. This challenge is epitomized in the paper, “School Physical Education: The Pill Not Taken” (McKenzie & Lounsbery, 2009). As identified there, PE is offered in most schools and has the potential to significantly contribute students’ daily accrual of moderate to vigorous physical activity, but students are not enrolled and policies within the school structure support their ability to opt out (NASPE, 2012).

High percentages of class time spent in management (over 31%) in both JROTC and PE suggest similar instructional efficiencies and therefore, differences in physical activity or lesson contexts were not likely due to instructional capability. Though again limited to one week’s worth of observations, the great differences in the proportion of class time that students in JROTC and PE spent in knowledge and game play, suggest the lessons had very different curricular goals. While there may be cognitive and/or affective parallels between JROTC and PE, our study found few; in fact, the general content of JROTC and PE were different, with PE focusing more on fitness, game play, and physical activity knowledge and JROTC focusing mostly on military knowledge and skill development.

JROTC is a national curriculum and is supported by each branch of the military (10 U.S.C. 102-Junior Reserve Officer's Training Corps, 2011). Its implementation may vary from school to school, district to district, and from state to state, thus the greatly contrasting differences in the physical activity and lesson contexts we found in JROTC and PE in this study may not be generalizable. Thus, there is a need to replicate our study of the implementation of JROTC and PE in more schools in more geographically diverse school districts and states. Additionally, numerous programs and activities other than JROTC are commonly substituted for physical education (NASPE, 2012); how they are conducted (e.g., student physical activity levels, session contexts, instructor behavior) relative to the physical education programs they replace should also be subjected to investigation.

Overall, our study found no compelling similarities during the observed lessons to substantiate the substitution of JROTC classes for PE. Furthermore, given the importance of physical activity as a health indicator and that PE is a main evidence-based strategy to provide and promote it with students (IOM, 2013), programs being permitted to serve as alternatives for PE should be required to at least substantiate their contribution to physical activity outcomes.

Education policy should ensure that prior to being accepted as a substitute for PE, the programs under consideration should be evaluated empirically for their ability to provide and promote physical activity and to increase physical fitness and generalizable motor skills. Approval should be for a specified period of time (e.g., 5 years), and in order to be renewed the courses should at least be required to demonstrate maintenance of the substitution criteria that was used for the initial approval. To ensure fidelity to standards, approved substitution programs should also be periodically audited to ensure maintenance relative to established standards for PE in the state in which they are approved.

Conclusions and Implications

JROTC and PE lack comparable lesson contexts and physical activity outcomes or; students were engaged in substantially different content and were provided significantly different levels of physical activity. This study failed to provide any salient evidence that JROTC content is an appropriate substitute for PE. Similar studies that compare PE with other commonly substituted programs are needed.

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What Does This Paper Add?

This study is the first to compare physical activity and lesson context in PE with an alternative program, JROTC, which is a common substitute for course credit in required PE. The results showed that JROTC did not provide physical activity or course content that was comparable to PE and that the likelihood of state or national standards for PE would be met during it. There is great need to develop a strong evidence base that prevents the further erosion of student enrollment in PE, and we hope this study will inspire replications and a broad line of research that compares physical activity in PE and other courses commonly substituted for PE. Lastly, we believe that findings of the study will foster policy related discussions on existing substitute programs for PE and the conventional procedures for approving them.

Table 1
Mean and SD percentage of observed time for student physical activity and lesson contexts during JROTC and PE Lessons (N=76)

Outcome	JROTC N=38 M (SD)	PE N=38 M (SD)	t-value	Cohen's d ^d
<i>Student Activity Levels</i>				
Lying Down %	0.4 (1.3)	0.6 (2.4)	-0.49	-0.10
Sitting %	47.1 (28.7)	17.3 (15.5)	5.63***	1.29
Standing %	29.8 (19.8)	21.5 (10.9)	2.27*	0.52
Walking %	18.8 (14.9)	49.4 (17.4)	-8.23***	-1.89
Vigorous %	4.0 (7.8)	11.3 (6.1)	-4.56***	-1.04
MVPA ^a %	22.8 (19.7)	60.7 (18.6)	-8.64***	-1.98
Sedentary ^b %	77.2 (19.7)	39.3 (18.6)	8.64***	1.98
Lessons fulfilled 50% MVPA guideline %	7.9 (27.3)	76.3 (43.1)	-8.27***	-1.92
<i>Lesson Context</i>				
Management %	33.9 (10.3)	31.9 (13.4)	0.70	0.17
Knowledge %	38.3 (28.3)	5.9 (15.3)	6.20***	1.42
Fitness %	8.7 (18.3)	20.3 (26.0)	-2.25*	-0.52
Skill %	13.3 (18.1)	2.9 (11.2)	3.02**	0.69
Game Play %	4.7 (12.7)	30.1 (32.2)	-4.52***	-1.04
Other %	1.1 (3.8)	9.0 (22.6)	-2.13*	-0.48

Note: two-tailed independent samples t-tests.

^a MVPA = moderate to vigorous physical activity, sum of Walking and Vigorous.

^b Sedentary = sum of Lying down, Sitting, and Standing.

^c Percent of lessons during which students engaged in MVPA at least 50% of the time

^d Cohen's d = effect size

Table 2
Unadjusted Incidence Density Ratios Predicting Association between Lesson Type and
Rate for Each Variable (ref=JROTC Lessons)

Outcome	Estimate	95% Confidence Limits
<i>Student Activity</i>		
Lying Down	1.716	0.401-7.352
Sitting	0.367***	0.268-0.502
Standing	0.722*	0.536-0.973
Walking	2.624***	1.988-3.463
Vigorous Activity	2.897***	1.635-5.132
MVPA	2.669***	1.978-3.602
Sedentary Behavior	0.511***	0.433-0.603
<i>Lesson Context</i>		
Management	0.932	0.790-1.100
Knowledge	0.160***	0.088-0.290
Fitness	2.351	0.862-6.411
Skill	0.216*	0.054-0.861
Game	6.401**	1.800-22.767
Other	8.310	0.875-78.904

Note: Estimates compare PE classes to JROTC lessons;

two-tailed tests

*
p<.05

**
p<.01

p<.001