COMPARISON OF THE BARRIERS TO THE DELIVERY OF CHILDREN’S PHYSICAL ACTIVITY IN TWO RURAL CALIFORNIA SCHOOL DISTRICTS

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ABSTRACT
In Central California’s agricultural communities, the rate of pediatric obesity is above the national average. Community and school-based interventions have been developed to combat this epidemic, which disproportionately affects minority groups. A targeted intervention partnering with a Mexican-origin group was the Niños Sanos Familia Sana (NSFS) study—a multifaceted intervention created to slow down the rate of BMI increase in young children in two rural school districts. This study focused on the physical activity component of NSFS with three goals in mind: (1) to examine the locations where teachers engaged their students in school physical activity (SPA); (2) to identify teachers’ perceived barriers to their delivery of SPA; and (3) to analyze teachers’ perceptions regarding strategies to improve their SPA programs. During the 2015-2016 school year, kindergarten through fourth-grade teachers (N=32) from the intervention and control districts completed a Classroom Barriers to Physical Activity survey. Results indicated that the strongest barrier to SPA time was taking time away from teaching academic subjects and that teachers could improve their physical activity curriculum with more resources. Analyzing the barriers to SPA time in low-income rural school districts could give researchers better insight into the development of more effective SPA interventions at similar sites, leading to increased understanding of ways to increase SPA time, student health, and academic impact.

Keywords: childhood obesity, school physical activity, Latino health, school intervention, physical activity barriers

INTRODUCTION
Childhood obesity puts children at risk of developing serious health issues such as type 2 diabetes, hypertension, and heart disease.[1] In addition, psychological and behavioral consequences are also correlated with obesity.[2] Over the past several decades, the rate of childhood obesity in the United States has increased dramatically, and now approximately 1 out of every 3 children aged 2-19 years are considered overweight or obese.[3] However, this trend is not shared equally throughout the general population; subpopulations with certain ethnic groups are more highly affected.[4] For instance, the prevalence of overweight or obesity for children aged 2-19 is higher for Latino children (38.9%) in comparison to African American children (35.2%) and to non-Latino white children (28.5%).[3] Due to these disparities across ethnic groups, preventative interventions have been implemented to combat childhood obesity targeting specific ethnic groups.[5,6,7,8] One of these interventions targeting Mexican-American children was the Niños Sanos, Familia Sana (NSFS, Healthy Children, Healthy Families) study.

NSFS was a multifaceted intervention to slow down the rate of BMI increase in young children in two Mexican-origin communities from California’s agricultural Central Valley.[6] The baseline anthropometric measurements for children aged 2-8 years revealed that 51% of the population was overweight or obese, a rate much higher than the national average.[9] One strategy for reducing obesity in young children has been shown by increasing physical activity and reducing sedentary...
lifestyle.[10] The Centers for Disease Control and Prevention (2016)[11] recommend that children ages 6-17 should participate in at least 60 minutes of moderate to vigorous physical activity every day. However, the majority of children in the U.S. are not receiving this recommended time for physical activity.[12] Moreover, recent studies showed that the reduction in physical activity has been linked as a determinant of obesity in Latino children.[13] It is also reported that social and environmental factors influence physical activity in Latino children. For example, having a social support system such as family members nearby has shown to increase physical activity in young children.[14] In addition to the health benefits, regular physical activity in children has also been shown to enhance academic performance.[15] While the NSFS intervention was a larger-scale endeavor that researched multiple aspects of childhood obesity, this article will be discussing a component of the physical activity intervention to analyze teachers’ perceptions of school physical activity (SPA) in primary schooling.

A 2012 systematic review and meta-analysis investigated the effectiveness of physical activity interventions and concluded that these interventions only had a small effect on the physical activity levels of children and adolescents. [16] Metcalf et al.[16] highlighted that most of these physical activity interventions identified poor delivery—while hard to test—as a main factor for their limiting results. A proposed explanation given by Metcalf et al.[16] is that physical activity interventions might be replacing established activity sessions with periods of equally intense physical activities and consequently providing no significant results. In addition, Brynard (2009)[17] highlights the importance of community-based initiatives targeting children to include various stakeholders, including children’s perspectives, to increase the efficacy of the intervention. One way to strengthen SPA interventions could be to partner with schoolteachers to obtain their insights about present SPA conditions.

Previous studies on teachers’ perceptions of SPA identified reduced time or limited time as a main barrier to the delivery of SPA.[18,19] However, similar studies researching the perceptions of primary school instructors teaching in rural Mexican-heritage communities of the U.S. remain understudied. Therefore, the purpose of this study was to: (1) examine where teachers engaged their students in SPA; (2) identify teachers’ perceived barriers to SPA time; and (3) analyze teachers’ perceptions regarding strategies to increase and improve their SPA time. For the NSFS study, SPA time was defined as activity that did not include lunch or recess time, but included the time that teachers engaged children in physical activity outside of academic lessons.

**METHODS**

**Study Design**

This study took place at two rural school districts in Fresno County. The demographic makeup of the primary schools in these districts were over 90% of Mexican origin. In addition, family economic and educational levels, as well as employment characteristics, shared high similarities.[6] According to the County Health Rankings & Roadmaps (2016).[20] Fresno County had a higher rate of adult obesity, children in poverty, violent crimes, and a lower median household income than the state average. This study was part of the physical activity component of the NSFS intervention, which lasted from 2012 through 2015. In the participating schools, physical education was a daily constituent of the academic schedule. Baseline measurements of the NSFS study found that there were no trained physical education teachers and that classroom teachers led the physical education activities in the schools. After meetings between research staff and school administrators, the school administrators in the intervention district hired trained physical education teachers to teach SPA to their students. At the same time, classroom teachers in the control district continued to lead the SPA time at their schools.
During the 2015-2016 school year, teachers from the intervention and control district were asked to complete a researcher-developed survey titled Classroom Barriers to Physical Activity. The sample size consisted of 32 kindergarten-4th grade teachers from both districts. All the teachers, including physical education teachers, from the participating schools and grade levels, were invited to complete the survey and offered an economic incentive for their participation. As shown in Table 1, the teachers were categorized as one of the three different groups: (A) Classroom teachers from the intervention group, (B) physical education teachers from the intervention group, and (C) classroom teachers from the control group. Group A consisted of the classroom teachers from the intervention district that taught SPA at baseline, prior to district hire of trained physical education teachers. Group B consisted of the trained physical education teachers hired to teach SPA in the intervention district during the NSFS study. Lastly, Group C consisted of classroom teachers from the control district that taught SPA as usual without the NSFS intervention.

From December 2015 to January 2016, research staff distributed paper surveys and collected them through in-person visits to the participating schools. All teachers who participated in the study completed and signed consent forms given by the research staff. The surveys were coded to ensure teacher anonymity. This study received approval from the Institutional Review Board at the University of California, Davis.

**Study Instrument**

The Classroom Barriers to Physical Activity survey asked (1) the location where teachers usually engaged their students in physical activity; (2) the frequency of taking students on walks and/or runs; (3) a ranking of perceived barriers to school physical activity; and (4) teachers' perceptions regarding strategies to increase physical activities in the schools. The choices for the location in physical activity engagement were the following: classroom, playground, school gym, playing field, and other with open-ended written options. In addition, teachers were given the opportunity to choose more than one location. Teachers were also

**Table 1.**

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Background Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Classroom teachers from the</td>
<td>- Conducted the physical education block in the schools from the intervention group before</td>
</tr>
<tr>
<td>intervention group</td>
<td>the NSFS intervention.</td>
</tr>
<tr>
<td></td>
<td>- Teachers were not certified to teach physical education.</td>
</tr>
<tr>
<td>B) Physical education teachers from</td>
<td>- Conducted the physical education block in the schools from the intervention group during</td>
</tr>
<tr>
<td>the intervention group</td>
<td>the NSFS intervention.</td>
</tr>
<tr>
<td></td>
<td>- Teachers in this group were the only ones trained and certified to teach physical education.</td>
</tr>
<tr>
<td>C) Classroom teachers from the</td>
<td>- Conducted the physical education block in the schools from the control group during</td>
</tr>
<tr>
<td>control group</td>
<td>the NSFS intervention.</td>
</tr>
<tr>
<td></td>
<td>- Teachers were not certified to teach physical education.</td>
</tr>
<tr>
<td></td>
<td>- Schools in this group did not acquire trained physical education teachers.</td>
</tr>
</tbody>
</table>
asked if they take students on walks and/or runs. A follow-up question included, “If yes, how many minutes do your students walk or run round trip?” Next, a ranking of the barriers consisted of the following choices: time spent teaching academic subjects, weather conditions, school schedules, lack of physical activity equipment, lack of knowledge of teaching physical activity, and other that included open-ended comments. To assess teachers’ perceptions, the survey included an open-ended question asking, “What will help you increase your daily physical activity with students?”

Data Analysis
Survey data was coded and entered into spreadsheets. Descriptive statistics were conducted through IBM SPSS version 22. The locations for physical activity engagement were tested for marginal independence between two categorical variables. Walking and running exercise times for the three groups were compared using two different non-parametric approaches: the Kruskal-Wallis test and Permutation test. The ranking of the teachers’ perceived barriers to physical activity was analyzed using a unique method known as the Bayesian Average, which is a weighted sum that balances between the overall average and individual average. For a variable with only a few observations, the average is drawn closer to the overall average of the dataset, while for a variable with a substantial number of observations, the average is drawn closer to the variable’s actual mean. The open-ended comments of the survey were classified and grouped using word content analyses and to explore potential solutions to these barriers. All collected survey data were included for analysis, despite teachers’ reporting discrepancies (i.e., incomplete surveys).

RESULTS
Physical Activity Engagement
Descriptive statistics revealed the preferred locations for physical activity engagement in the schools. Self-reported data showed that most teachers engaged their students in multiple locations. These results are summarized in Table 2 below. Multiple Marginal Independence showed that there is not enough evidence to conclude that the three groups and the location of physical activity engagement have dependency (i.e., the preference for location does not depend on the group).

From the three groups, the average daily time for runs and walks was higher for the physical education teachers from the intervention group (Table 3). The Kruskal-Wallis test and Permutation test suggested that there was no significant evidence to say that the group means were different.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Classroom</th>
<th>Playground</th>
<th>School Gym</th>
<th>Playing Field</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom teachers from the intervention group (n=8)</td>
<td>6 (75.0%)</td>
<td>7 (87.5%)</td>
<td>0 (0.0%)</td>
<td>4 (50.0%)</td>
<td>2 (25.0%)</td>
</tr>
<tr>
<td>Physical education teachers from the intervention group (n=5)</td>
<td>2 (40.0%)</td>
<td>4 (80.0%)</td>
<td>1 (20.0%)</td>
<td>4 (80.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Classroom teachers from the control group (n=19)</td>
<td>8 (42.1%)</td>
<td>12 (63.2%)</td>
<td>0 (0.0%)</td>
<td>12 (63.2%)</td>
<td>0 (0.0%)</td>
</tr>
</tbody>
</table>
Physical Activity Engagement

In all groups, the results showed differences in the responses of locations for SPA engagement. Due to the lack of physical education teachers, classroom teachers from the intervention and control groups were responsible for physical education. This could suggest that the quality of the SPA was low due to the teachers' lack of knowledge in teaching physical education. However, the locations for engagement were different among these two groups—undermining a potential influence between the lack of training in physical education and the location for SPA engagement. For the control group, the most frequently used locations included a playground and a playing field. In comparison, the classroom teachers from the intervention group reported having engaged their students mainly at a classroom and a playground. It is essential to highlight that the teachers from both groups taught in neighboring school districts that share similar environmental characteristics (as described in the Methods).

Barriers to Physical Activity

The ranking of the teachers' perceived barriers to physical activity was calculated using the Bayesian Average. Based on a 5-point scale to represent the strength of the barrier, the higher the number represents the stronger the barrier. The results are summarized in Table 4.

Teacher's Perceptions

A detailed summary of the teachers' perceptions of increasing SPA is presented in Table 5. In all groups, most teachers reported that increasing resources would help their physical activity curriculum. In addition, classroom teachers from the control and intervention groups reported that trained physical education teachers would be helpful.

DISCUSSION

This study helped to recognize the barriers that affected the delivery of children’s physical activity in primary schools in rural Central California. By identifying these barriers, researchers may better understand the needs of teachers in order to initiate effective physical activity interventions that will increase the quality and time of SPA. Findings from this present study provide relevant information to help build and enhance physical activity interventions and curricula at primary schools in rural communities.
Table 4.

*A summary of the strength of the barriers (5 = strongest, 1 = weakest)*.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Teaching Academic Subjects</th>
<th>Weather Conditions</th>
<th>School Schedules</th>
<th>Lack of PE Equipment</th>
<th>Lack of Knowledge of Teaching PE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom teachers from the intervention group (n=7)</td>
<td>4.86</td>
<td>3.36</td>
<td>3.75</td>
<td>3.54</td>
<td>3.29</td>
</tr>
<tr>
<td>Physical education teachers from the intervention group (n=5)</td>
<td>3.67</td>
<td>3.60</td>
<td>3.67</td>
<td>3.03</td>
<td>1.87</td>
</tr>
<tr>
<td>Classroom teachers from the control group (n=15)</td>
<td>4.20</td>
<td>3.50</td>
<td>3.37</td>
<td>3.60</td>
<td>2.80</td>
</tr>
</tbody>
</table>

Table 5.

*A summary of teachers’ responses to “What would help you increase your daily physical activity with students?”*

<table>
<thead>
<tr>
<th>Groups</th>
<th>More Resources</th>
<th>More Time</th>
<th>Nothing (Fine the way it is)</th>
<th>Focus Should be on Academics</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom teachers from the intervention group (n=8)</td>
<td>11 (68.8%)</td>
<td>2 (12.5%)</td>
<td>3 (18.8%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
</tbody>
</table>
- Trained PE instructors: 2
- More equipment/materials: 1
- Physical Activity Curriculum: 2
- More facilities for PE: 2
- PE Training: 2
- Student Teacher Ratio: 2
| Physical education teachers from the intervention group (n=5) | 5 (62.5%)     | 2 (25.0%) | 1 (12.5%)                   | 0 (0.0%)                     | 0 (0.0%) |
- More equipment/materials: 1
- More aides: 1
- More facilities for PE: 2
- Student Teacher Ratio: 1
| Classroom teachers from the control group (n=17) | 19 (70.4%)     | 1 (3.7%)  | 3 (11.1%)                   | 3 (11.1%)                    | 1 (3.7%) |
- Trained PE instructors: 6
- More equipment/materials: 7
- Physical Activity Curriculum: 3
- Teaching support, aides, sharing with other teachers: 2
- PE training/knowledge: 1
Barriers & Perceptions of SPA

All three groups identified the time to teach academic subjects as their strongest perceived barrier to SPA. Some classroom teachers even commented that many of their students were not performing well academically and that they felt pressure to spend more teaching time on academic subjects. This could provide insights into why the physical education teachers reported the time to teach academic subjects and school schedules as their strongest barriers, despite only being responsible for physical education. As a result, SPA time could have been affected by prioritizing time and focus on academics. This hypothesis may be supported by a survey conducted by the Washington Teachers’ Union and EmpowerEd (2018)[22] demonstrating that nearly half of the District of Columbia public school teachers felt added pressure from school administrators to alter the grades of their students to meet passing academic benchmarks. However, the time devoted to physical activity should not be compromised because studies have shown that there is a positive relationship between physical activity and academic performance.[23] A cross-sectional study has shown that academic success is linked with higher fitness levels even after controlling for confounders such as parental education.[24] Consequently, physical activity is not only beneficial for better health status but also academic performance.[15] Ideally, teachers in these schools should participate in in-service programs that emphasize the physical and cognitive benefits of physical activity.

Other perceived barriers by the classroom and physical education teachers from both districts were the weather conditions and the lack of physical activity equipment. The weather conditions were an important concern considering the limited infrastructure of the schools, such as the lack of a school gymnasium. The negative impact of limited infrastructure for SPA was supported by a study that showed a positive association between physical activity opportunities and facilities availability in U.S. middle schools.[25] Additionally, as expected, the physical education teachers ranked the lack of physical activity equipment as a lower barrier than the classroom teachers. Though this can be a hindrance, a previous study found that increasing physical activity equipment was not sufficient to increase physical activity engagement in children.[26] By delivering a more structured SPA program that involves hiring physical education teachers and training classroom teachers in physical education, higher engagement in SPA can be accomplished.

Limitations

Although the research team carefully collected the data and thoughtfully analyzed the results, it is important to note that some teachers did not fully complete the surveys, which limited the sample size and may have affected the power of the statistical analysis. In addition, due to the close proximity of the two study communities, the classroom teachers from the control district became aware that the schools in the intervention district had hired trained physical education teachers to teach physical education. This might have resulted in a confounding variable if the teachers from the control district perceived the barriers to SPA differently because of the presence of physical education teachers at the intervention site. A similar case can also have applied to the classroom teachers from the intervention district. One possible scenario is that due to the presence of physical education teachers, some classroom teachers from the intervention district may have become more aware of their lack of knowledge in teaching SPA. Additionally, the classroom and physical education teachers from the intervention district completed the surveys during the same timeframe when the classroom teachers were no longer leading the SPA programs. These classroom teachers had an increased risk of recall bias and perhaps an increased perception of having minimal SPA resources.
CONCLUSION
In California’s Central Valley, pediatric obesity has been identified as a serious threat to the health of children. Since children spend a considerable amount of time in schools, the importance of physical activity should be emphasized with school administrators and teachers. School districts or the state should augment funding to these low-resourced schools to supplement the existing school budget for support of SPA programs. Also, school officials should be reminded of the national recommendations for children’s physical activity as determined by the CDC (2016). Future studies should continue to research the barriers of SPA by incorporating the perceptions of teachers, school administrators, parents, and even schoolchildren. These studies should also encompass a larger sample size and repeated measures to monitor possible changes in perceived barriers. This will allow for a more nuanced understanding of developing more robust SPA interventions that will help reduce the rate of childhood obesity in this population.

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