

PATTERNS OF PHYSICAL ACTIVITY AMONG AMERICAN INDIAN CHILDREN: AN ASSESSMENT OF BARRIERS AND SUPPORT

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ABSTRACT: Estimates indicate that 10% to 50% of American Indian and non-Indian children in the U.S. are obese, defined as a body mass index $\geq 95^{\text{th}}$ percentile of the NHANES II reference data. Pathways is a two-phase, multi-site study to develop and test a school-based obesity prevention program in American Indian schoolchildren in grades three through five. During Phase I feasibility prior to initiation of the Pathways trial, data were collected related to physical activity patterns, and the supports of, and barriers to, physical activity. Nine schools from communities representing six different tribal groups participated in this study. Multiple measures were used for data collection including direct observation, paired child interviews, and in-depth interviews and focus groups with adults. Students completed the self-administered Knowledge, Attitudes, and Behaviors (KAB) survey, and a Physical Activity Questionnaire (PAQ). Barriers to physical activity at schools included a lack of facilities, equipment, and trained staff persons for PE. Adults were not consistently active with their children, but they were highly supportive of their children's activity level. Children reported a strong enjoyment of physical activity and strong peer support to be physically active. Weather conditions, safety concerns, and homework/chores were common barriers to physical activity reported by children and adult caregivers. The informa-

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Supported by the National Heart, Lung, and Blood Institute of the National Institutes of Health (HL-50867, HL-50905, HL-50885, HL-50907, and HL-50869).

tion was used to design culturally and age-appropriate, practical interventions including the five physical activity programs for schoolchildren in the Pathways study.

KEY WORDS: obesity prevention; American Indian; physical activity; formative assessment.

INTRODUCTION

Obesity among American Indian children and adolescents is increasing.¹⁻³ Estimates of obesity in the United States indicate that 10% to 50% of American Indian and non-Indian children and adolescents are obese, when obesity is defined as a body mass index (BMI) \geq 95th percentile of the NHANES II reference data.^{4,5} Childhood obesity has been associated with an increased risk for adult obesity, cardiovascular disease and type 2 diabetes.⁶ This association emphasizes the importance of obesity prevention among American Indian children and adolescents.

A sedentary lifestyle has been identified as a primary risk factor for obesity and other chronic diseases.⁷ Although increasing physical activity is suggested as an important health behavior, the amount of time children and adolescents spend doing physical activities is inadequate nationwide, and recommended goals include both increasing the proportion of schools that require physical education (PE) and the proportion of young people participating in daily school PE.⁸⁻¹⁰

Observations of several school-based PE classes have revealed that elementary students are participating in an average of eight minutes of moderate to vigorous physical activity per class, which accounts for less than 25% of class time.¹¹ The recent CATCH multi-center randomized trial, however, showed that by modifying the PE curriculum and conducting staff development, students in intervention schools increased participation in moderate-to-vigorous physical activity (MVPA) by over 50% of the existing PE class time.^{12,13} The intervention students also reported more minutes of daily vigorous activity than controls and the difference in the groups was maintained but attenuated in a three-year follow-up.¹⁴ Another study of PE in elementary schools incorporated the SPARK PE program and involved three intervention schools and four control schools in San Diego. The results showed increased MVPA in intervention schools during PE but did not show any increase between groups in physical activity outside of school.¹⁵

Few data are available regarding the physical activity patterns of

American Indian children. Fontvieille et al.¹⁶ reported that Pima Indian boys and girls (average age of 10 years) spent significantly less time engaged in sport leisure activities than their non-Indian counterparts. The boys and girls completed self-reports of past week and past year physical activity. The investigators did not report details of activities or opportunities for physical activity during and outside of the school setting.

Watching television and videos, and playing video games have become increasingly popular, and may act as substitutes for moderate and vigorous physical activities in adolescents.¹⁷ Results from NHANES-III¹⁸ showed that 67% of children aged 8 through 16 years watched at least two hours of television per day, with 26% surveyed watching more than four hours per day. Those children watching greater than four hours of television per day had a higher body fat and body mass index than those who watched less than two hours per day. Gortmaker et al.¹⁷ reported that 33% of youth surveyed (ages 10 to 15 years) watched more than five hours of television per day, and those who reported this level of television viewing had an 8.3 times greater incidence of obesity. Harrell et al.¹⁹ reported that elementary school children spent approximately 30% of their leisure time watching television; the boys in this study reported spending 33% of their leisure time playing video games. Fontvieille et al.¹⁶ found that Pima Indian children reported watching television a minimum of two hours per day, and these children were more obese than their Caucasian counterparts. These findings emphasize the need to develop interventions to prevent obesity in American Indian children.

Pathways is a two-phase, multi-site study to develop and test a school-based obesity prevention program in American Indian schoolchildren in grades three through five. The study involves five universities, seven American Indian nations, and the National Heart, Lung, and Blood Institute. The universities involved are: The University of New Mexico; The University of Arizona; Johns Hopkins University; The University of Minnesota, and The University of North Carolina. The seven American Indian nations involved in the full-scale study are: Navajo (New Mexico/Arizona); White Mountain Apache and San Carlos Apache (Arizona), Tohono O'odham, Gila River (Arizona); and Oglala Lakota and Sicangu Lakota (South Dakota).

As little information was available regarding dietary and physical activity behaviors in American Indian children, a formative assessment was completed during the Phase I feasibility prior to initiation of the Pathways trial to document these behaviors in American Indian communities, schools, families, and among school children to aid in the development of

appropriate intervention strategies.²⁰ The purpose of this paper is to report on data collected as a part of the formative assessment related to patterns, supports, and barriers to physical activity.

METHODS

The formative assessment was conducted in nine schools from communities representing six of the seven participating tribal groups. Procedures involved participation of school children, child caregivers, and school personnel. Data were gathered at pilot schools and the corresponding communities. The schools that participated were selected based upon their interest in the project, number of students, and geographic location. Data collection methods included direct observation, child-paired and in-depth interviews, focus groups, the Knowledge, Attitudes, and Behaviors (KAB) survey, and a Physical Activity Questionnaire (PAQ). Approval was obtained from each university's Institutional Review Board and from each tribe, and informed consent was attained from all participants. The types of data gathered and the corresponding collection methods are displayed in Table 1 and described briefly.

Direct Observation

A total of 48 observations were performed during recess, PE classes, in the morning before classes started, and in the afternoon immediately after classes ended. These observations were done to determine available resources related to physical activity, children's physical activity patterns, and current practices used to teach and/or supervise physical activity and PE. The range of children's activities at school and the amount of time spent participating in different activities were recorded.

Interviews

Ten in-depth interviews were conducted with school officials from each site to collect information on classroom and PE facilities. Additional information gathered included existing PE curricula, the feasibility of additions or modifications to the curricula, and the number of sessions and minutes of PE offered per week.

Seventy-six in-depth interviews were also conducted with pairs of children. The goal was to conduct at least 20 paired child interviews at each site, 10 interviews each with third and fifth grade students. Activity-

TABLE 1

Qualitative and Quantitative Methods Used to Obtain Physical Activity-Related Information from American Indian Nations

<i>Method Used</i>	<i>Sample</i>	<i>Type of Information Obtained</i>
Direct observation of Recess	24 observations ^a	Information on children's physical activity patterns.
Direct observation of Classrooms	24 observations ^a	Information on children's physical activity patterns and observations on how children are currently being taught about physical activity and PE.
In-depth interviews with school officials	10 officials	Information on school resources, PE facilities; assess current curriculum, feasibility and openness to changes in curriculum.
Paired-child interviews	76 child pairs (38 boy pairs, 38 girl pairs)	Exploration of attitudes and perceptions about physical activity.
Focus groups with caregivers	14 groups	Exploration of parent's perception of their role in changing physical activity patterns in children and identify adult's personal beliefs about physical activity.
Interviews with caregivers	47 caregivers	Exploration of parent's perception of their children's physical activity level, their role in changing physical activity patterns in children, and activities done as a family unit.

TABLE 1 (Continued)

<i>Method Used</i>	<i>Sample</i>	<i>Type of Information Obtained</i>
Focus groups with teachers and teachers' aides	12 groups	Identification of barriers to successful implementation of Pathways intervention and description of personal beliefs/attitudes about physical activity.
Surveys	366 children	Exploration of knowledge, attitudes, and behaviors (KAB) related to social support, enjoyment, and barriers to physical activity, and level of involvement in various physical activities and TV/video watching (Physical Activity Questionnaire, or PAQ).
	117 children	Assessment of children's involvement in a variety of physical activities and in sedentary activities such as watching TV and playing video games using a Physical Activity Questionnaire (PAQ).

^aEach observation was approximately one hour in length.

related questions in these interviews focused on the children's attitudes and perceptions about physical activity, the types of activities in which the children participate, and motivations that might be productive in changing their activity levels.

Classroom teachers selected 5 boys and 5 girls representing varying educational levels to be interviewed. Each child selected was asked to identify a same-sex friend who joined the interview to make a pair. Each pair was interviewed by a trained staff member for approximately 45 minutes. A standardized interview guide was used across sites for the interview

which included closed- and open-ended questions that focused on types of physical activities the children engaged in before, during, and after school. Children were asked about the types of activities they most enjoyed, what types of activities they participated in during recess and PE class, and their participation in sports. Questions were also asked about the chores the children did routinely at home. The mentioning of an activity by any one or both children in the pair was counted as one response for an activity. It is important to note that most pairs agreed in all of their responses.

Focus Groups and Interviews with Adults

A total of 26 focus groups were conducted with child caregivers, teachers and teachers' aides, and 47 in-depth interviews were conducted with child caregivers. The child caregivers were asked about types of activities done with children outside of the home. They were also asked for suggestions of activities that parents and family members could do to help children maintain a healthy body weight, and were queried about activities parents can do to encourage children to be more active at home. The teachers and teachers' aides were asked about personal beliefs and attitudes related to the importance of physical activity, recess and PE classes, perceived barriers to successful implementation of physical activity programs, and availability of physical activity programs in their communities.

Knowledge, Attitudes, and Behaviors (KAB) Survey

A KAB survey was developed by a subcommittee of the Pathways research team and administered to 366 fourth grade students from the six communities participating in the formative assessment study.²¹ For 25 of these students, there were missing data or gender was not reported, resulting in a total sample of 165 boys and 173 girls. Although the KAB addressed a range of health topics, only the results related to physical activity are presented here. The KAB included four questions regarding the enjoyment of physical activity, four questions related to social support for physical activity at home, six questions related to peer social support of physical activity, and ten questions designed to assess the students' perceptions of barriers to physical activity.

Physical Activity Questionnaire (PAQ)

The PAQ developed by the Pathways research team was administered to a total of 117 third and fourth grade children (58 boys, 59 girls) from five of the six communities. The purpose of the PAQ was to assess

the children's involvement in a variety of activities at different times during the day, and their involvement in sedentary activities such as watching TV and playing video games. Students were asked if they participate in the specified activities "none," "a little," or "a lot" before, during, and after school.

Training of Data Collectors

A minimum of two staff persons from each site were trained to conduct the formative assessments, including at least one ethnically matched person. Standardized formative assessment training sessions were conducted within several weeks of data collection, and involved demonstration, role playing, and didactic components.²⁰

Analyses of Data

The interviews and focus groups were audio-taped. All textual data collected from field notes and audio-taped information were expanded or transcribed and entered into a computer using WordPerfect software. Numeric data were tabulated and recorded in the appropriate forms and matrices developed for this purpose. All qualitative data were sent to researchers at Johns Hopkins University for coding and tabulation. The textual data were coded, managed and analyzed using GOfer 2.0 (Microlytic, 1989) according to methods described by Gittelsohn.²² Main findings were summarized in the form of matrices, permitting cross-site compilations and/or comparisons.

Quantitative data were analyzed at the Pathways Study Coordinating Center. SAS version 6.12 (SAS Institute Inc., Cary, NC) statistical software was used to generate frequency distributions for the KAB and PAQ categorical variables. Results from the KAB survey and PAQ were combined for all sites, with Chi-square tests conducted to determine if any differences existed between boys and girls in their responses. The alpha level was set at $p < .05$.

RESULTS

School Environment

Table 2 summarizes selected qualitative data collected by observation and interviews related to physical activity and PE in schools. While

TABLE 2

Status of Physical Activity Programs and Resources as Determined by Direct Observation, Interviews, and Focus Groups in Nine American Indian Schools

Facilities/equipment available	Most commonly reported: gymnasium, outdoor play areas (dirt), basketball court, some playground equipment Least commonly reported: indoor equipment, walking path
Amount of recess	One to three times per day, from 10 to 20 minutes
Possible alternatives for physical activity	Western dance, walking program.
Ways to make increased activity sustainable in school	More intramural activities, less emphasis on competition, more before-school activities, train teachers to teach PE, more equipment and organized activities
Pre- and post-school activities at the school	Occasionally school games run over to post-school period, otherwise no activities were reported.

most schools reported having a gymnasium (or a multi-purpose room used as a gymnasium), basketball court, and outdoor play area with some playground equipment, very few schools reported having a walking path, or indoor equipment. Some schools reported that the outdoor play area was “wild,” having snakes and other barriers to activity present during certain times of the year. In addition, many gymnasiums/multi-purpose rooms were relatively small and often doubled as a cafeteria, and were often the only location for physical activity during adverse weather conditions.

Recess varied from school to school, with reports ranging from one to three sessions per day, with each session ranging from 10–20 minutes. Among the nine schools, some offered no PE classes and others offered PE up to four times per week for 45 minutes per class. The statements below illustrate the variety of opportunities for PE at the schools:

“There is no PE. The teachers take children out a few times a week. A visitor comes by for one month each year to teach the children how to play lacrosse.”

“We have broken it (PE) down by grades. In kindergarten, the teachers are responsible for their PE. In the first through third grades, they have something like PE twice a week, and we do have PE instruction. Grades four through eight are scheduled three times a week.”

Very few school personnel offered alternatives for physical activity, but at some sites occasional dance classes or a walking program were offered. At some schools, naps and TV viewing were substituted for PE.

In response to the question of how to sustain increased activity in schools, the most common suggestion was to offer more activities prior to school. Results indicated that most children rode the bus after school, making this an unreasonable time to offer physical activity programs outside of school hours. Lengthy commutes (e.g., one to two hours) by school personnel also were an issue. One teacher stated:

“We open the gym to local teams that participate in boxing. These are not school-sponsored activities. The school doesn’t have a physical activity program for sports after school. We have a lot of teachers who commute.”

In addition, schools lack equipment necessary for activities, and classroom teachers lack the confidence and skills to teach PE. Children identified sports such as basketball, volleyball, and baseball as activities they enjoyed, but they did not like to run around the track. Very few schools reported before and after class activities held at the school.

Family Support for Physical Activity

Most family members and child caregivers who were questioned regarding their physical activity habits reported that they do not regularly participate in exercise or physical activities. Barriers reported by adults include embarrassment, lack of exercise facilities and financial resources, working long hours, and a history of illnesses such as diabetes. Caregivers were quoted as saying they don’t exercise because:

“... too busy,” and “... the programs are not there.”

“... A lot of people don’t have transportation.”

“... they (kids) are always at school and because I’m working and I don’t have time to do those things with them.”

“... If you have a partner it would be easier but if you’re going by yourself it is scary.”

“I don’t do any exercise because I’m not fat enough.” “... it’s hard to exercise because it costs money.”

For the parents who reported being physically active, walking, aerobics, household chores, and working at carnivals and community events were commonly reported activities. For many families, the most common activity done was shopping. Parent's statements included:

"I walk one mile five days a week, but not for the last week and a half."

"I walk two miles, one mile down the road and one mile back, at least three times a week. On weekends we go hiking."

"I go walking with my boys in the evening, then I take the exercise class here, that country and western dance class, and a low impact aerobic class . . ."

"We go fishing and camping."

"I start cleaning the house . . . everyday I do house chores."

"We usually go to the movies, and go to the Mall where we walk a lot."

In regards to social support at home (Table 3), children reported that adults are not active with them most of the time. When adults were active with their children, it was more common for boys (26.8%) to report that the adults in their house were active with them than girls (17.6%). While adults may not be regularly active with their children, they appear to be supportive of their children's activity. Over 80% of the boys and girls reported that the adults in their house take them to places where they can play sometimes or most of the time, and 79.8% of boys and 67% of girls are encouraged to play hard by the adults in their house sometimes or most of the time.

Peer Social Support

Children report overall high levels of peer support for being physically active (Table 3). Playing hard, friends wanting them to play hard, and having fun while playing hard was reported as sometimes or most of the time by approximately 90% of the children. Being selected by other kids to play was reported at least some of the time by more than 80% of the children, with 90% of the children reporting that they ask their friends to play sports and active games regularly. In approximately 80% of the responses, children reported trying to encourage their friends to play instead of watching TV.

Children's Activity Preferences

On the KAB the majority of children reported that they enjoy all types of activities, and that they enjoy running, playing team sports, and

TABLE 3

Results of the Knowledge, Attitudes, and Behaviors (KAB) Survey Related to Social Support for Physical Activity for American Indian 4th Grade Students (Boys, N = 165; Girls, N = 173)

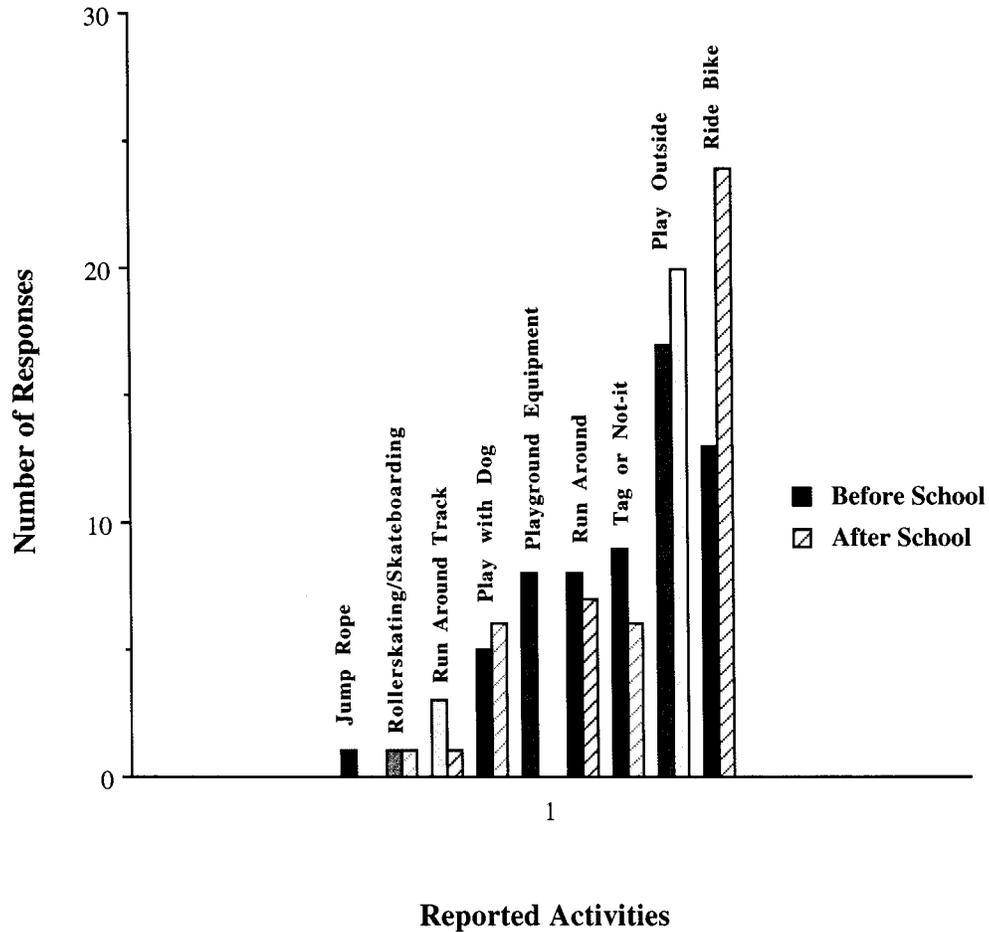
Question	% of Total Responses					
	Most of the Time		Sometimes		Never/Almost Never	
	Boys	Girls	Boys	Girls	Boys	Girls
<i>Social Support at Home</i>						
1. The adults in my house are active.	27.9	23.9	61.8	59.1	10.3	17.0
2. The adults in my house are active with me.	26.8	17.6	47.6	63.1	25.6	19.3
3. The adults in my house take me places where I can play hard or play sports.	34.5	29.5	47.3	50.6	18.2	19.9
4. The adults in my house want me to play hard.	39.6	26.7	40.2	40.3	20.1	33.0
<i>Peer Social Support</i>						
1. My friends play hard.	56.4	41.7	34.5	47.4	9.1	10.9
2. My friends want me to play hard.	41.5	36.4	48.2	50.0	10.4	13.6
3. I have fun when I play hard with my friends.	50.3	38.6	41.2	51.1	8.5	10.2
4. When playing sports or games, other kids want me on their team.	35.8	33.7	46.7	53.1	17.6	13.1
5. I ask my friends to play sports and active games.	29.6	30.7	58.6	61.4	11.7	8.0
6. I try to get my friends to play sports and active games instead of watching TV.	41.4	33.5	36.4	47.7	22.2	18.8

playing hard. Significantly more girls (25%) than boys (13.5%) responded that some kids think playing hard is boring sometimes ($p < .05$).

During the paired child interviews, the children reported enjoying a variety of activities. Figure 1 shows the types of recreational activities children reported doing before and after school. Many of the children reported being unable to play outside either before or after school due

FIGURE 1

Recreational-type activities done before and after school as reported in 75 paired-child interviews.



to darkness and too many chores. Other children were limited in their opportunities to play outside by their parents. As one parent observed:

“[My son] goes out a lot and plays. He doesn’t really stay inside. We have to yell at him to come in when it gets dark. He plays a lot of sports, basketball, baseball, but not during school. [My daughter] is outside playing a lot; she keeps asking me for a bike, but I’m scared. I’m afraid she will get into trouble.”

The recreational physical activities the children most commonly engaged in were general running around, playing outside or with friends, playing tag, playing with their dog, and riding a bike. When asked what activities children do in their spare time, parents stated:

“... beadwork, reading, drawing, playing outdoors, TV.”
 “... basketball, TV, play with the rabbit.”
 “... TV, videos, talking on the phone.”

Figure 2 shows the types of sport-related activities the children reported during the paired-child interviews as activities they did before and after school. The most popular sport-related activity was basketball, with a few children reporting playing football. During school, the most popular physical activities reported were basketball, tag, and playing on playground equipment. Teachers' observations included:

“I witness activities such as exercises, running competitions and certain games where the kids require some balancing, hand-eye coordination, ... mental as well as physical.”
 “We're also getting involved in track running. It is not a team thing, just individuals competing against classmates. We feel it builds self-esteem ... sometimes we have a father-son basketball game.”

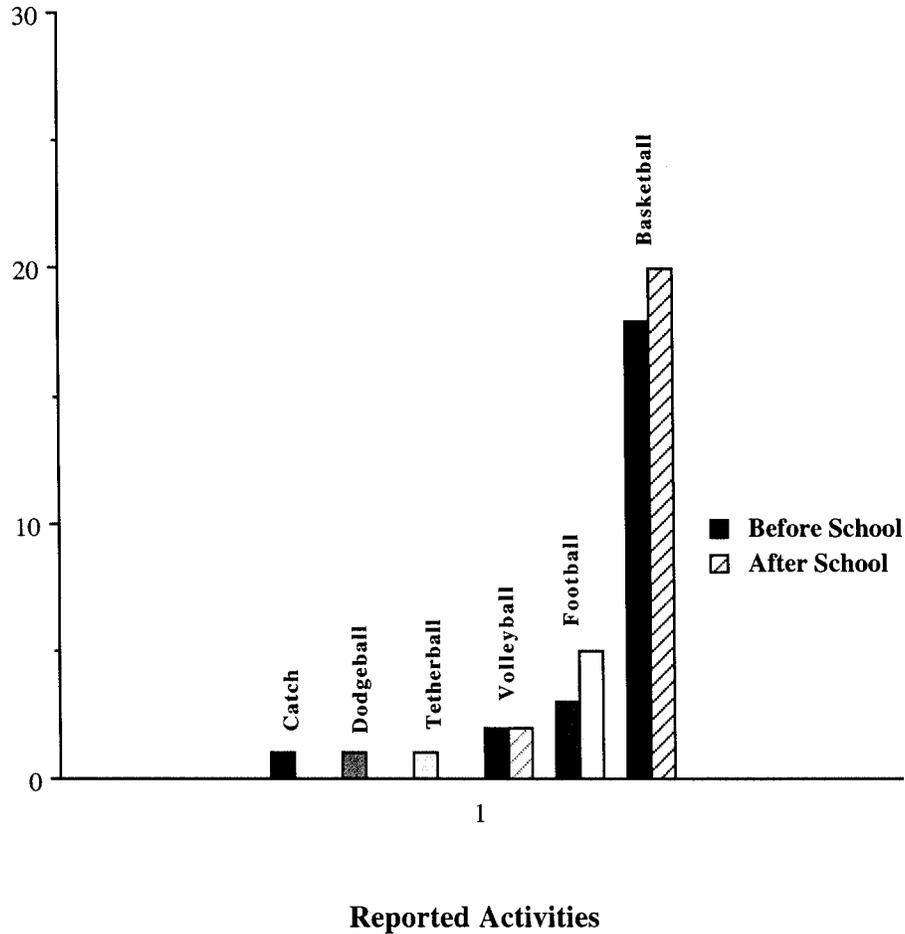
Barriers to Physical Activity and TV Watching

Table 4 includes responses to the KAB survey related to students' perceptions of barriers to physical activity. Homework, being too tired, weather, and being afraid of getting hurt were barriers most reported that sometimes influence the children's physical activity. Over 65% of the children reported that they had someone to play with most of the time. A safe location to play was reported most of the time by 57.1% of boys and 35.3% of girls, but an average of 48% of both boys and girls reported that they had a safe place to play only sometimes. Significantly more girls reported being afraid of getting hurt when playing hard (54.7% of girls as compared to 42.2% of boys, $p < .05$). Consistent with this finding was that more boys (57.1%) than girls (35.3%) ($p < .05$) reported it was safe to play outside most of the time. Significantly more boys (47.4%) reported that there were team sports they could join most of the time as compared to girls (35.9%) ($p < .05$).

Table 5 includes responses to the PAQ related to watching TV/videos and playing video games before and after school. Almost 79% of children watch TV/videos before school a little or a lot, with 86% report-

FIGURE 2

Sport-type activities done before and after school as reported in 76 paired-child interviews.



ing these activities after school. The percentage of children playing video games before school a little or a lot was 40.1%, with 53.1% reporting this activity a little or a lot after school. Significantly more boys play video games before school, with 26% of boys reporting this activity as compared to only 10% of girls ($p < .05$). There were no other significant differences of watching TV/videos or playing video games between boys and girls.

TABLE 4

Results of the Knowledge, Attitudes, and Behaviors (KAB) Survey Related to Students' Perceptions of Barriers to Physical Activity in American Indian 4th Grade Students (Boys, N = 165; Girls, N = 173)

Question	% of Total Responses					
	<i>Most of the Time</i>		<i>Sometimes</i>		<i>Never/Almost Never</i>	
	Boys	Girls	Boys	Girls	Boys	Girls
1. I have someone to play with.	62.8	69.4	30.8	26.5	6.4	4.1
2. I am allowed to play outside.	66.0	55.6	29.5	40.2	4.5	4.1
3. I have too much homework.	10.9	8.2	55.8	62.4	33.3	29.4
4. I am too tired to play sports or active games.	14.1	13.6	41.0	45.0	44.9	41.1
5. The weather is too bad to play sports or active games.	14.2	7.6	65.8	71.8	20.0	20.6
6. I am afraid of getting hurt when I play hard.	10.4	17.1	42.2	54.7	47.4	28.2
7. There is a place to play near my house.	64.3	64.7	28.6	29.4	7.1	5.9
8. It is safe to play outside.	57.1	35.3	39.0	56.5	3.9	8.2
9. I am too sick to play hard.	6.5	5.3	40.9	52.4	52.6	42.4
10. There are sports teams that I can join.	47.4	35.9	39.0	52.4	13.6	11.8

DISCUSSION

The formative assessment provides a picture of physical activity opportunities in each community and school. The information reported in this paper presents a unique review of the physical activity environment in six American Indian communities. The methods used in this study are not limited to American Indian communities, as this type of formative assessment can be implemented in non-Indian schools and communities.

In the present study, we found that lack of facilities, equipment, and trained staff persons for PE were common challenges in many of the schools. Despite these challenges, children reported enjoying a variety of physical activities. Although child caregivers were not consistently active,

TABLE 5

Results of the Physical Activity Questionnaire (PAQ) Related to Watching TV/Videos and Playing Video Games

	<i>None</i>	<i>A Little</i>	<i>A Lot</i>
	% (Number)	% (Number)	% (Number)
<i>Before School</i>			
Watch TV/Videos	21.4 (25)	52.1 (61)	26.5 (31)
Play Video Games	59.8 (70)	22.2 (26)	17.9 (21)
<i>After School</i>			
Watch TV/Videos	13.7 (16)	53.0 (62)	33.3 (39)
Play Video Games	47.0 (54)	27.0 (31)	26.1 (30)

^aThere are two missing values from this question, for a total number of responses = 115.

they were highly supportive of their children's activity level. Adults and children reported that weather conditions, safety concerns, and homework/chores were common barriers to physical activity. This information was used to design physical activity programs for the Pathways study. The goal is to provide culturally appropriate, practical, and sustainable physical activities for schoolchildren in these communities.

There are some limitations to this study. The small number of schools sampled in this feasibility study may have led to some bias. In addition, some factors (e.g., weather) had more of an impact on physical activity at some sites as compared to others. Observation of activities done at home would have been very useful, but performing more in-depth exploration of the families' lives was considered too invasive. A potential also exists in this study for the adult participants to report responses that may be considered to be more socially acceptable. We feel confident, however, that the patterns of physical activity reported are appropriate for the children, as the direct observations of children agreed with the activities reported by the children on the PAQ.

There appear to be a number of barriers to regular physical activity at the schools involved in this study. The barriers documented include facility limitations, insufficient equipment, lack of trained personnel, and inconsistent frequency and duration of PE in some schools. A number of the schools involved in this study use the gymnasium or multi-purpose room as the central location for both school and community events. Due to these challenges with overlapping schedules, the facilities may not be

available to serve all grades for PE due to the limited availability of space. Outdoor areas, often wild and not maintained as play areas, were considered unsafe at some schools.

Some of the schools also reported limited equipment for physical activity. While virtually all schools own some equipment that can be used during recess and PE classes, the adequacy of equipment and lack of staff to allow for all students to be regularly involved was limited in many cases. Many of the schools that reported offering PE also reported the necessity to cancel it due to other activities taking place at school or in the community, or due to extreme weather conditions. These challenges caused opportunities for PE to be inconsistent, as some schools in the present study reported having no PE, while other schools reported having PE up to four times per week for 45 minutes per class.

Although there may be some barriers to regular physical activity for these American Indian children, they reported enjoying physical activity, and they participate in activities similar to those reported by children of other ethnic groups.¹⁹ Playing basketball and football, riding a bike, playing outside, running around, and playing on playground equipment were common activities reported by the children.

Responses to the Knowledge, Attitudes, and Behavior (KAB) questionnaire indicate both potential barriers and enablers for regular physical activity. Barriers include things such as weather, chores and homework, lack of a safe place to play, and few adult role models. Although the weather is an uncontrollable factor in the lives of these children, schools involved in Pathways are attempting to prioritize the available space for PE for their children. Household and outdoor chores may take the place of free playing, but are necessary responsibilities of children. These chores can be alternative opportunities to increase energy expenditure when necessary. Safety concerns appear to be important determinants of physical activity for children living in both rural and urban environments. Davis and Jones²³ reported that children ages 9 to 14 years of age living in an urban environment expressed concerns with safety in the neighborhood due to crime, traffic danger, and lack of adequate facilities. Students in the present study also reported that they are less likely to be active due to darkness and parents' concerns for their safety.

The effect that parents and other adults may have as role models for physical activity is not clear. Freedson and Evenson²⁴ found that the physical activity levels of parents and children are significantly related, and aggregated among families. Moore et al.²⁵ also found a significant relationship between the activity levels of parents and children, and these researchers suggest that children model their parents' level of physical activ-

ity. In contrast, Dempsey et al.²⁶ found no relationship between the physical activity levels of parents and children. These researchers suggest that the parents' perception of their children's physical activity levels may be a more important factor in determining the children's participation in moderate to vigorous physical activities. However, it makes intuitive sense that parents who are aware of the benefits of physical activity for their children and supportive of their children increasing physical activity will have a positive influence on their children.

These results show that students enjoy being physically active, consider it fun, and that they have strong peer support to be physically active. These findings are similar to those reported for non-Indian children. Studies have shown that feeling good, having fun, and having a higher self-esteem are associated with increased participation in physical activity and sport-related tasks.^{27,28} Altman et al.¹⁸ reported that children's participation in a community cardiovascular disease prevention program was strongly associated with self-efficacy and the value that the students placed on having a heart healthy environment. Based on social learning theory, the Pathways components (i.e., classroom and PE curricula, family education and school food service) have been designed to incorporate culturally compatible learning modes and to emphasize the value of increased physical activity and healthy eating for overall health of the individual and community.²⁹

Similar to American Indian and non-Indian children in other studies, the majority of children in the Pathways formative assessment report watching television (TV) a little or a lot each day. Andersen et al.,³⁰ Gortmaker et al.,³¹ and Fontvieille et al.¹⁶ have reported a significant relationship between obesity, TV watching, and lower levels of physical activity in children of different ethnicities. Results from the NHANES III survey³⁰ showed that boys and girls across the U.S. who watched four or more hours per day of TV had a significantly higher body fat and BMI than those who watched less TV. Gortmaker et al.³¹ reported that a school-based health behavior intervention decreased obesity and TV watching in African-American, Hispanic, and Caucasian girls, and each hour of reduction in TV watching predicted the reduced obesity prevalence. Fontvieille et al.¹⁶ reported that Pima Indian girls watch more TV than their Caucasian counterparts, and the Pima Indian boys and girls reported significantly less past week sport leisure activity than Caucasian boys and girls. Dwyer et al.³² found a weak positive correlation between BMI and TV watching/playing video games, but there were no differences in average time spent watching TV between overweight and normal weight children.

The American Indian children in the feasibility study had an average percent body fat of 35.6% ($\pm 6.9\%$) and 38.8% ($\pm 8.5\%$) for boys and

girls, respectively.³³ The methods employed did not allow for an analysis of the relationship between TV watching and body fat levels. It is important to note that several researchers have found no correlation between TV watching, low levels of physical activity, and obesity in children.^{19,34,35}

Except for publications related to the Pathways project, there appears to be no results published for any large-scale obesity prevention trials in American Indian children. However, two smaller-scale diabetes prevention projects developed for American Indian youth have been described in the literature. Macaulay et al.³⁶ review an intervention program and baseline data for Mohawk children in grades 1 through 6 that incorporates school-based and community-sponsored health education, nutrition, and physical activity events. No formative assessment procedures were reported, and specific changes in school-based physical activity opportunities were not described. Teufel and Ritenbaugh³⁷ describe a program developed for high school students living in the Zuni Pueblo community. Focus groups and questionnaires were administered to students exploring their knowledge, attitudes, and beliefs about nutrition, physical activity, and type 2 diabetes. In addition, interviews with school personnel were conducted to assess the current status of the school's health requirements and the school lunch program. No data from these formative assessment procedures were reported. While students in this study were provided with opportunities to increase physical activity, it is unclear whether participation in physical activities was required. At the mid-point of the intervention, sitting heart rate was found to have decreased significantly, suggesting some improvement in cardiovascular fitness.

In conclusion, the results of the Pathways formative assessment provides descriptive data on the current status of physical activity and specific barriers and enablers for increasing physical activity within the American Indian communities involved. These results may also be useful when developing physical activity interventions for non-Indian schools, particularly those schools located in rural communities with limited support for physical education. The physical activity component of the main Pathways trial is designed to address many of the existing barriers and provide more supportive environments for students.

Five areas are being addressed in Pathways to increase the physical activity of children. First, exercise breaks are added to regular class time. The exercise breaks are conducted by teachers and students, and involve performing activities that are described on index cards that are in a Pathways Activity Box kept in the classroom. Second, teachers are encouraged to allow regular recess breaks. Third, the SPARK PE curriculum¹⁵ is being implemented in the school schedule three days per week for at least 30

minutes per class to increase the amount of time children participate in moderate and vigorous intensity physical activity. This program emphasizes keeping all students physically active during PE, and supports an environment that is less competitive. Fourth, American Indian games are taught to the school staff and the students, and these games are used during PE class time as well as recess. Fifth, a strong focus on staff development is provided in all of these areas. In addition, efforts are being made to provide a positive atmosphere for more physical activity during and outside of school by increasing parental involvement and support through family events that focus on physical activity and encouraging school administrators to provide supportive environments for physical activity.

The focus of the complete Pathways program is also addressing many of the areas suggested in the *Guidelines for School and Community Programs to Promote Life-long Physical Activity Among Young People*.³⁸ Schools and tribes can enact policies at the local and tribal level that require PE in schools and allocate funds for equipment. Institutions of higher education can train all elementary school teachers in PE. Parents can work with schools and tribal government to insist that physical activity opportunities are available at school, provide physical activity opportunities for their children outside of school, and be physically active with their children. Working together, community members, tribal leaders, school personnel, and institutions of higher education can increase the opportunities for children to be more physically active and lead a healthier life.

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