ASSOCIATION OF AMERICAN INDIAN CULTURAL IDENTITY WITH PHYSICAL ACTIVITY

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Objective: Cultural factors are associated with health behaviors among American Indians. Accordingly, the objective of our study was to investigate whether cultural identity, defined as the primary language spoken at home, is associated with: 1) higher total physical activity levels, and 2) levels of leisure-time physical activity recommended for health benefits in a diverse sample of American Indians.

Design: Cross-sectional analysis of 5,207 American Indian adults 18 to 82 years. Participants resided on the Oglala Sioux ($n=2,025$) and Cheyenne River Sioux ($n=1,528$) reservations in South Dakota, and the Gila River Indian Community ($n=1,654$) in Arizona.

Results: Bicultural participants in South Dakota, but not Arizona, reported significantly higher total physical activity compared to the English-only group ($P<.05$). About 35% of English only speakers, 39% of American Indian/Alaska Native only speakers, and 39% of participants speaking both languages met the 150 minutes/week activity threshold. Odds of being sufficiently active were higher among bicultural respondents in both regions when compared to respondents endorsing only English, controlling for sociodemographic and health-related covariates ($P<.05$).

Conclusion: Bicultural respondents among tribal members in South Dakota had significantly higher total physical activity, and higher levels of sufficient leisure-time activity in both South Dakota and Arizona, compared to those who spoke either language exclusively. Interventions that encourage American Indians to develop their bicultural efficacy and to draw on resources for healthy living that may be available in all the cultures with which they identify are recommended. (*Ethn Dis*. 2014; 24[1]:1–7)

Key Words: American Indian, Culture, Language, Physical Activity

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INTRODUCTION

The health benefits associated with regular physical activity are well established.[1] However, the majority of US adults do not engage in levels of physical activity sufficient to maintain or improve health,[2] thus changing this behavior is an important national health objective.[3,4] Although a recent report indicates that American Indian adults exhibit levels of physical (in)activity similar to other racial/ethnic groups in the United States,[5] overall levels are still much lower than current national health objectives. At the same time, health disparities for many conditions strongly linked to insufficient physical activity, including obesity and diabetes,[1,6] are extremely high in this racial/ethnic subpopulation. For example, after adjusting for population age differences, about 16% of the total adult population served by the Indian Health Service had diagnosed diabetes in 2009, with rates varying from 5.5% among Alaska Native adults to over 33% among American Indian adults in southern Arizona, compared to 7% of age-adjusted non-Hispanic Whites in the same time period.[7]

Such observations suggest efforts to increase general activity levels in American Indians are needed. At the same time, research showing that household-type activities represent the most frequent type of physical activity among American Indians[5] suggests an additional issue. Because this category includes many physical activities performed at less than a moderate-intensity, such as mopping or sweeping, persons for whom it is a main source of energy expenditure may not experience adequate stimulus to sufficiently improve cardiorespiratory fitness and reduce chronic disease risk.[1,8,9] Researchers seeking to reduce the burden of chronic disease in American Indians are thus well advised to seek out variables related to individuals' participation in physical activities, specifically in moderate-to-vigorous activity, and to consider how such knowledge can inform interventions.

Growing evidence argues that cultural factors are associated with health behaviors among American Indians. For example, identification with Native culture has been associated with in-

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creased physical activity levels among American Indian women.[10–12] More recently, consumption of traditional foods and participation in traditional physical activities have been associated with cultural factors in a diverse sample of Alaska Natives.[13] Related work suggests that biculturalism, or competence in the cultural values, knowledge, and skills characteristic of a minority and the majority culture, may be similarly and perhaps more strongly associated with health outcomes.[14] The overlapping literature on culture and health have encouraged targeted health interventions adapted to incorporate elements of tribal cultures, and these have proven effective for changing behaviors related to outcomes ranging from disease screening[15] to substance abuse[16] in American Indian populations.

To complement and expand upon this literature, we drew on data collected from two large American Indian tribes from distinct regions in the United States to investigate whether relationships with culture might extend to the domain of health relevant to physical activity. Specifically, we hypothesized that American Indian adults who affiliate with tribal identity or with a bicultural identity will have: 1) higher total physical activity levels, and 2) higher levels of sufficient leisure-time physical activity, as compared to those who identify only with the dominant culture.

METHODS

Data Source and Collection

Data for our study were derived from the Education and Research Towards Health (EARTH) cohort. Specifically, we used data derived from 5,207 individuals examined by the Black Hills Center for American Indian Health (BHCAIH). The participants were aged 18 to 82 years residing on the Oglala Sioux (n = 2,025) or Cheyenne River Sioux (n = 1,528) reservations in South Dakota, or the Gila River Indian Community (n = 1,654) in Arizona. The focus of EARTH was to examine the demographic, dietary, behavioral, and cultural factors associated with cancer and chronic diseases among American Indians and Alaska Natives. A detailed description of the design and implementation of EARTH has been previously published.[17] Each participating tribe approved the study, as well as both the Phoenix and Aberdeen Area Indian Health Service Institutional Review Boards.

Participants were recruited for EARTH through print and radio advertising, community presentations, and word-of-mouth. The Northern Plains cohort was age-representative within 5% to 5-year age cohorts of the US 2000 Census among self-identified American Indians within the same counties, which in this situation are wholly contained within both reservation boundaries. Overall, approximately one-third of all adults on the three participating reservations and communities were included in EARTH.

At baseline, conducted from December 2003 to April 2006, participants provided written informed consent, completed comprehensive, computerized questionnaires using computer-aided self-interviewing technology,[18] and underwent anthropomorphic measurements and laboratory testing. The questionnaire collected information on participants' demographics, dietary history, health history, physical activity, and cultural identity. Clinical data included anthropometric measurements, automated blood pressure measurement, and fasting lipid and glucose levels. Participants also completed an exit interview, and at the conclusion of the visit were given individual feedback consisting of a health report. Small incentives ranging in value from approximately $20 - $30 were provided.

Cultural Identity

We used primary language preference as an indicator of cultural identity, our main independent variable. Responses to the question asking for primary language spoken at home included 1) American Indian/Alaska Native, 2) English, or 3) both. This question was part of the questionnaire's culture and lifestyle domain, for which 4 items were developed by study staff based on meetings with small groups and individual tribal people and pre-tested with tribal members.[17] The language item was especially appropriate for our purposes. Primary language is widely accepted as a core measure of cultural identity,[19,20] including research in tribal populations;[15,21–23] moreover, only this item allowed responses suggesting both monocultural and bicultural experience. Both traditional food and physical activity behaviors were associated with speaking a Native language at home among a large group of Alaska Natives examined in the EARTH cohort.[13]

Physical Activity Instrument

A detailed physical activity questionnaire adapted from the Cross-Cultural Activity Participation Study[24] was developed to collect data on activity performed at various levels of intensity over the past year. The questionnaire has two sections. The first section asks about the frequency and duration of seven different activities done in a typical week in the past month, such as household chores, child, elder or dependent care, driving or riding in a motorized vehicle, sitting or reclining and watching TV, and reading, sewing, beading, carving, or using a computer. These activities are believed to be relatively stable over a year's time. The second section asks about a range of broad activities done for more than 10 minutes at a time in the past year. This list of activities was intended to encompass the major sources of physical activity by American Indian and Alaska Native populations, such as activities performed during leisure time, around the home, and at a paid job. All participants providing 'yes' responses were then queried on the frequency and duration of the activities.

Each activity was also weighted by its relative metabolic cost using the appropriate value in the *Compendium*,[25] referred to as a metabolic equivalent (MET), thereby deriving MET-hours per week as the final unit of expression. One MET represents the energy expenditure for an individual at rest, whereas a 10-MET activity requires 10 times the resting energy expenditure. For example, light effort household chores such as dusting or straightening up is about 2.5 METs, whereas playing basketball is about 6.0 METs.

Detailed information on data processing and scoring of the physical activity instrument has been published elsewhere.[5] Briefly, using the weighted MET scores for each activity, seven distinct categories of activity were created, including: sedentary, occupational, leisure-time, household, passive transportation, active transportation, and hunting/fishing. These categories were developed to correspond to the major types of activities described in the *Compendium of Physical Activities*.[25] These seven categories were derived by summing the individual weighted MET scores for the applicable activities comprising each category. Finally, a total intensity-weighted physical activity score was created by summing the occupational, leisure-time, household, active transportation, and hunting/fishing categories (the sedentary and passive transportation categories are excluded). The data were examined using normality plots and frequency distributions to determine outliers and implausible responses. In most cases, no more than the upper one percent of the distribution was discarded, representing, for example, more than 18 hours of activity reported in a given day.

Individuals were categorized as being sufficiently active or not sufficiently active using a cut-point of more or less than 150 minutes/week of physical activity during leisure-time. The 150 minutes/week physical activity threshold corresponds to the minimum level recommended to achieve or maintain health benefits.[1] Estimates of leisure physical activity were calculated as a sum of the total minutes per week spent participating in 25 different activities (eg, jogging, swimming, dancing, and winter sports) comprising the leisure-time domain.

Statistical Analysis

Demographic characteristics and physical activity data were described using means and standard deviations for continuous variables and percents for categorical variables. Regression models were fitted to assess the relationship between language spoken at home (independent variable) and total intensity-weighted physical activity and leisure-time physical activity (dependent variables), stratified by region. Two different models were constructed for each of the dependent variables. In the first analysis, a linear regression model was fitted to estimate mean levels of intensity-weighted physical activity with corresponding 95% confidence intervals for each language group. In the second analysis, a logistic regression model was fitted to estimate the odds of performing at least 150 minutes/week of leisure-time physical activity, dependent upon the language group. Both unadjusted and adjusted models were estimated. All adjusted models controlled for sex, age, education (categorized as $<$ high school vs $\geq$ high school), and the physical component score (PCS) from the SF-12 Health Survey used as a measure of physical functioning.

Before statistical treatment, the distribution of the physical activity variables was investigated to assess for deviations from normality. A logarithmic transformation was conducted to normalize the data, with regression analyses being conducted on the raw and transformed data. No differences were found between these models, thus the models estimated on the untransformed data are reported for ease of interpretation. Data were analyzed using Predictive Analytics Software (PASW version 18.0, SPSS Inc.). Statistical significance was established a priori at $P<.05$.

RESULTS

Descriptive Characteristics

Physical activity data were available from 5,090 of the 5,207 adults examined by the BHCIAH. Table 1 displays select demographic characteristics of the sample by region. Overall, the majority of the participants were female, had a mean age of 37 (range 18–82), and reported English as the primary language spoken at home. Significant differences were found between regions with respect to body mass index (BMI, kg/m^2), leisure-time physical activity level, high school graduation rates, and distribution of both primary language spoken at home and sex (all $P<.05$).

The mean BMI of 32 kg/m^2 would indicate that the sample was, on average, obese. Overall, roughly 24% of participants fell into the normal weight category (BMI <25 Kg/m^2), 26% were overweight (BMI >25, <30 kg/m^2), and 51% were obese (BMI >30 kg/m^2). Of the 25 individual leisure-time physical activities including in the survey, walking for exercise was the most commonly endorsed (44%), followed by stretching/yoga (37%), weight lifting or resistance exercise (26.5%), basketball (25.9%), and running/jogging (25.8%). While all activities were endorsed at

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Table 1. Select demographic characteristics stratified by region

	Overall $N = 5,090$	Southwest $n = 1,621$	Northern Plains $n = 3,469$
Continuous Variables[a]			
Age, years	37.2 (14.25)	36.9 (13.2)	37.40 (14.7)
Body mass index, kg/m^{2}[b]	31.9 (7.80)	35.0 (8.5)	30.44 (6.9)
Total leisure-time physical activity, minutes/week[b]	279.1 (503.4)	235.5 (441.1)	298.5 (531.4)
Total weighted physical activity, MET-hours/week	194.0 (223.9)	186.9 (209.4)	197.4 (230.5)
Categorical Variables[a]			
High school graduate, % yes[b]	63.1	46.5	69.4
Primary language spoken in home, %[b]			
English	61.3	67.1	58.5
American Indian/Alaska Native	7.8	5.4	8.9
Both	30.9	27.5	32.5
Sex, % male[b]	45.2	40.9	47.3

[a] Continuous variables shown as the mean (SD); categorical variables shown as %.
[b] Indicates a statistically significant difference between regions, using independent samples *t* tests for continuous variables and χ^2 tests for categorical variables.

some level, 17 of the activities were endorsed by <10% and several by <1%.

Culture and Total Intensity-weighted Physical Activity Levels

Table 2 displays the adjusted mean intensity-weighted physical activity levels by region, controlling for sex, age, education, and PCS. When estimating the relationship between respondents' cultural identity, as measured by language, and total intensity-weighted physical activity levels, the main effect was statistically significant for the Northern Plains tribe only ($P<.001$). Overall, bicultural participants in the Northern Plains (ie, those speaking both their Native language and English in the home) exhibited the highest intensity-weighted physical activity levels. Pairwise comparisons between groups in the Northern Plains demonstrated that bicultural participants reported significantly higher intensity-weighted physical activity levels compared to the English-only group ($P<.05$). The adjusted mean difference approached, but did not achieve, significance for the comparison between the American Indian/Alaska Native and English only groups ($P=.10$).

Culture and Sufficient Leisure-time Physical Activity

The proportion of participants within each language group who were sufficiently active during leisure-time, stratified by region, is presented in Table 3. Overall, approximately 35% of English-only speakers, 39% of American Indian/Alaska Native only speakers, and 39% of participants speaking both languages met the 150 minutes/week threshold. Participants in each region differed significantly in their total average minutes per week spent in leisure-time activities ($P<.05$), and the same pattern of leisure-time activity participation classified by language group was evident for each region after controlling for sex, age, education, and PCS. Specifically, the odds of being sufficiently active were significantly higher among bicultural respondents in both tribes when compared to respondents endorsing only English as their primary language; 1.62 times higher in the Southwest and 1.51 times higher in the Northern Plains.

Table 2. Weighted physical activity levels according to primary language spoken at home, stratified by region[a]

Tribe	English	American Indian/Alaska Native	Both
Southwest	186.91	205.16	199.71
Northern Plains[b]	185.28_{c}	208.87_{cd}	223.53_{d}

[a] Data presented as estimated marginal means for MET-hours/week adjusted for sex, age, education, and physical health sub-scale score (using the SF-36 instrument).
[b] Values with different subscripts (c, d) indicate statistically significant differences on MET-hours/week between language groups at $P<.05$.

DISCUSSION

Our analysis found no significant differences in total intensity-weighted physical activity levels or in sufficient leisure-time activity levels among exclusive tribal speakers as compared to exclusive English speakers in our Southwestern and Northern Plains respondents. This unexpected outcome may partly reflect measurement issues. In particular, the physical activity instrument used in EARTH invites respondents to report frequency and duration of 25 specific leisure-time physical activities. Although some activities have a clear resonance for tribal cultures, such as beading or dancing, the instrument is not adapted exclusively for American Indians. A measure that explicitly queried more culturally specific activities, such as tribal sports, might have elicited more affirmations, perhaps allowing a relationship to emerge. This is supported by research that suggests that Native individuals who identify with aspects of tribal culture participate in higher levels of traditional activities. For example, historic tribal societies pursued many subsistence activities requiring physical exertion, and a recent study of Alaska Natives found that individuals of all ages who spoke their tribal language at home had higher odds of engaging in culturally traditional activities, such as hunting, berry picking, or fishing by hand or set net, compared to those who spoke only English.[13]

Table 3. Association between primary language spoken at home and leisure-time physical activity levels[a] by region

Language	Southwest		Northern Plains	
	Active *n* (%)[b]	OR (CI)[b]	Active *n* (%)[b]	OR (CI)[b]
English	346 (31.9%)	1.0	734 (37.2%)	1.0
American Indian/Alaska Native	32 (36.8%)	1.33 (.81–2.17)	120 (40.4%)	1.25 (.94–1.66)
Both	159 (36.1%)	1.62 (1.25–2.10)	443 (40.7%)	1.51 (1.26–1.81)

[a] Defined as physical activity of any intensity reported during leisure-time in minutes/week; further categorized as active vs not sufficiently active using a threshold of ≥150 minutes/week.

[b] Data presented as *n* (%) or odds ratio (OR) with 95% confidence intervals (CI). The English-only language group was used as the reference category. Estimates are adjusted for sex, age, education, and physical health sub-scale score (using the SF-36 instrument).

It is alternatively possible that exclusive tribal identity is not significantly associated with physical activity in this sample, and this may be the more plausible interpretation in view of our other analytic findings. Specifically, we found that bicultural respondents who spoke both English and a tribal language at home had significantly higher total intensity-weighted physical activity levels in the Northern Plains, and higher levels of sufficient leisure-time activity in both regions, as compared to those who spoke either language exclusively. This finding is consistent with literature that suggest the unique value of biculturalism over any form of monoculturalism, whether defined in reference to a minority or the majority culture, including studies specifically conducted in American Indian populations.[26–29] In this view, biculturalism is the ideal condition "because it creates a sense of efficacy within the institutional structure of society along with a sense of pride and identification with one's ethnic roots."[30] In addition, the multiple social networks implied by bicultural identifications may enable access to a broader range of resources that promote health.[14]

The latter argument finds support in a growing body of research that associates biculturalism with a variety of social and health outcomes, including fewer internalizing behaviors and higher self-esteem,[31] lower BMI levels,[32] and higher rates of mammography screening.[33] The observed relationship between bicultural identity and physical activity in our study raises the possibility that the advantages of biculturalism may include having a healthy level of physical activity.

Our analysis has some important limitations. Our cross-sectional design cannot establish the direction of the relationship between biculturalism and physical activity. While it is more plausible that cultural identity influenced physical activity rather than the reverse, it is possible that other unmeasured variables affected the outcome. In addition, with the existing data we cannot explain why the benefits of biculturalism for total physical activity levels do not seem to hold true among members in the Southwest region, at least when expressed as total intensity-weighted physical activity levels (MET-hours/week). Although educational attainment was lower in the Southwest region compared to the Northern Plains, it is important to emphasize that we controlled for education (among other factors) in the analyses, so regional differences in the biculturalism-activity relationship are not likely confounded by regional differences in educational attainment. In addition, our results may not be generalizable to other American Indian tribes in either similar or different regions. Further research will be required to better understand the relationship between cultural identity and physical activity and how this may differ by tribal affiliation and/or geographic region. Similarly, we had no information on rural/urban living, which would be related to access to amenities and programs that may have influenced the findings.

There are well accepted limitations to self-report physical activity instruments; however, it was neither practical nor feasible to collect objective data on such a large sample of American Indians. Nonetheless, the instrument used in the EARTH cohort has been described and used in a number of studies,[5,13,17,34] and was found to have acceptable reliability and validity based on a small sub study of participants who wore pedometers. Finally, the estimates of leisure-time physical activity (Table 1) may be higher than expected because this calculation was not restricted to moderate-intensity activities exclusively. Instead, a total leisure-time physical activity level was calculated using the 25 individual activities within the leisure-time category of the instrument that also included five activities below the 4.0 MET threshold used to define moderate-intensity, such as stretching/hatha yoga (2.5 METs; 37% of subjects participated in this activity), and walking for exercise (3.5 METs; 44% of subjects participated in this activity). Although the majority of the 25 leisure-time activities were of a moderate intensity (17 of the 25 activities used to calculate this score were at least 4.0 METs), the most commonly reported activities were in fact those below the moderate-intensity threshold, suggesting that the instrument was not biased toward meeting recommendations for moderate intensity physical activity. In addition, the activity patterns in this study were consistent with previous reports when examined by demographic characteristics such as sex and age among American Indians.[5,35]

CONCLUSION

Cultural factors have been associated with health outcomes among American Indians. Our findings are at least partially consistent with this conclusion, and draw particular attention to bicultural identity as a potential support for healthy, physical lifestyles. Further research is needed to determine the extent to which relationships between culture and physical activity that have been identified in research in other tribal groups are broadly generalizable. Our findings may have implications for culturally appropriate interventions among American Indians. Specifically, interventions that encourage American Indians to develop their bicultural efficacy and to draw on resources for healthy living that may be available in all the cultures with which they identify are recommended.

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