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Lifestyle Physical Activity Behavior among South Asian Indian Immigrants

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Abstract

Background—Little is known of the physical activity behavior of South Asian Indian immigrants (SAIs), though they have more than twice the risk for cardiovascular disease (CVD) and diabetes than Whites.

Methods—A cross-sectional descriptive face-to-face survey design, comparing between men and women in leisure time (LTPA), household (HPA), and occupational physical activity (OPA). Participants also wore a Lifecorder EX (NL2200) accelerometer for seven days.

Results—Just over half (51.8%) of the participants met the recommended PA guidelines (150 minutes moderate-intensity or 75 minutes vigorous-intensity) through LTPA. The average number of daily steps was 6904.3, which is in the “low active” classification.

Discussion—Increasing lifestyle PA among SAIs is important; PA interventions appealing to gender and culture and with an aerobic component are needed.

Keywords

South Asian Indian immigrants; lifestyle physical activity; self-report measures; accelerometer

Introduction

The National Institutes of Health (NIH) Health Disparities Strategic Plan emphasizes the need for research focused on eliminating health disparities related to heart disease and diabetes in racial and ethnic minorities (1). South Asian Indian immigrants (SAIs), from the Indian Subcontinent, are the second-largest immigrant group ($n=2,765,155$) in the United States. SAIs carry more than twice the risk for cardiovascular disease (CVD) and diabetes than Whites (3–5). The CVD risk in SAIs appears to be greatest among the middle-aged (6, 7). Overall, the percentage of people aged 45–64 years with diabetes increased from 28.4% in years 1988–1994 to 32.2% for 1999–2000 (8).

According to the physical activity (PA) objective of Healthy People 2020, regular PA plays a significant role in lowering the risk of heart disease and diabetes (9). Unfortunately, prevalence of a sedentary lifestyle in SAIs is reportedly as high as 60% in the United States (10). Acculturative changes (11, 12), racial discrimination (10), questionable sense of community (10), and limited availability of family for social support (13) may negatively influence the health promotion behavior of SAIs.

According to our recent integrative review of prior studies that examined correlates of PA behavior in SAIs (14), one problem was the reliance on self-reported measures of PA that focused primarily on leisure time PA (LTPA). These studies showed that LTPA was higher in men SAIs than women (12, 15). The self-report measurement of a single domain of PA, however, could underestimate overall lifestyle PA in SAIs and miss PA obtained in household or occupational work. Immigrants often take physically demanding jobs not necessarily commensurate with their qualifications (16). Thus, total lifestyle PA that includes occupational physical activity (OPA), as well as LTPA, and household physical activity (HPA) (17) needs to be examined in SAIs.

The use of only self-report measures of PA in SAIs poses the potential for under- or overestimation because self-report measures are limited by problems with recall and inability to capture unstructured or unplanned PA. Objective measures such as accelerometers provide a means of quantifying PA behavior (18). Self-report measures may be useful in providing the context and type of PA (19). With the rise in the at-risk midlife SAI population in the United States, we need a better understanding of their lifestyle PA behavior as background upon which to develop targeted interventions to increase their lifestyle PA.

Thus, the purpose of this study was to (1) examine lifestyle PA behavior of midlife SAIs assessed by subjective (self-report) and objective (accelerometer) measures and (2) compare PA between SAI men and women in the domains of LTPA, HPA, and OPA.

Methods

Study Design and Participants

A cross-sectional descriptive face-to-face survey design was used. Inclusion criteria were: self-identified as SAI; immigrated to the United States directly from India; born in India (first generation); resided in the Chicago metropolitan area; spoke Hindi (the national language in India) or English; and had no disability that interfered with walking. No one was excluded due to an existing health problem. Recruitment sites were primarily seven SAI religious institutions: one Sikh gurudwara (serving over 2500 people), five Christian churches (serving 75–125 people), and one Hindu temple (serving over 10,000 people) located in a large metropolitan area in Illinois, which ranks fifth in SAIs.

At all institutions, flyers were posted on the bulletin boards, given to office personnel to distribute to the congregation, and handed out by the bilingual investigator to people after services. Six presentations were held (two each at the gurudwara, church, and temple) informing congregants about the study. Weekly announcements were made at the gurudwara

and one Christian church for three consecutive weeks during worship hours. Also, social networking occurred among church members and their outside friends. A total of 122 persons were screened: 51 from the gurudwara, 42 from the temple, and 24 from a Christian church. An additional five persons were referred by a member of one of the Christian churches; although Christian, they did not attend any of the contact religious institutions. Twelve were ineligible for either not being an immigrant or not meeting the age criteria. The recruitment period lasted six weeks (June 19-July 31, 2011). A total of 110 SAIs were eligible and participated in the study.

Measures

The demographic characteristics were age, gender, education, marital status, number of children, household size, employment, income, regional background, religion, and preferred Indian language. We also included 5-point scale of self-reported measure of global health (1 = *excellent*, 2 = *very good*, 3 = *good*, 4 = *fair*, 5 = *poor*) from the Behavioral Risk Factor Surveillance System (20). Two self-reports and one objective measure (accelerometer) were used to assess lifestyle PA. The self-report measures were translated from English into Hindi, with sequential use of multiple translation techniques (committee method, focus group, and think-aloud interviews with cognitive probing) to promote equivalence between the original and target language (21).

The 28-item Community Healthy Activities Model Program for Seniors (CHAMPS) questionnaire was the self-report measure of weekly minutes of 22 LTPA and 6 HPA items (22). These items had an assigned MET (metabolic equivalent) value for light- (<3 MET; e.g., stretching, yoga, or tai chi), moderate- (3–5 MET; e.g., walking briskly for exercise), and vigorous (>5 MET; e.g., jogging, playing basketball)-intensity activity. Of the 22 LTPA items, five were light-, eleven moderate-, and six vigorous-intensity. Of the six HPA items, three were light-, (e.g., sweeping, light gardening) and three moderate-intensity (e.g., heavy gardening).

Participants were asked how many times per week they performed the activity (frequency) and how much time they spent per week doing the activity (duration). The duration was multiplied by frequency for each activity and was classified into six categories of hours ranging from <1 hour/week (coded 0.5 hour) to 9 hours/week (coded 9.75 hours). Then these hours were converted into minutes. Finally, minutes spent in light-, moderate-, and vigorous-intensity activity per week were obtained by summing the number of minutes spent in each intensity activity. The test-retest reliability of CHAMPS with older whites, African Americans, and Asian American adults for total activity was .62 (23). The validity of the instrument for moderate to vigorous intensity LTPA was significant but small ($r=.16-.32$) with estimated VO_2 max in young and middle aged African American adults (24).

The 12-month Tecumseh Occupational Activity questionnaire was the measure of the number of minutes per week spent in 16 OPAs (25). Three items had light-intensity codes (e.g., sitting light work); seven moderate (e.g., walking carrying 2–25 pounds); and six vigorous (e.g., standing or walking carrying about 75 lbs). Time spent in OPA was calculated to be equal to the average number of hours the participant worked per week during the year. Minutes spent in light, moderate-, and vigorous-intensity activity per week

were obtained by summing the duration per week for each intensity code. The two-week test-retest coefficient of 0.73 demonstrated its reliability in midlife Caucasian and African American women (26). The validity of the instrument was supported by significant correlation (0.46) with a 7-day occupational activity record (27). For each activity domain (LTPA, HPA, and OPA), participants were classified as physically active if they had moderate-intensity PA of 150 minutes/week or vigorous-intensity PA of 75 minutes/week (28).

The Lifecorder EX (NL2200) accelerometer was used as an objective measure of lifestyle PA. The Lifecorder EX is based on solid-state electronic technology, which uses a piezoelectric strain gauge (a technology with no moving parts) to accurately record each step taken. The piezoelectric gauge has been shown not to be affected by increasing BMI or circumference of the waist and hip (29). The reliability of this accelerometer as measured by steps per day was between 0.95 to 0.99 when 10 persons simultaneously wore two accelerometers (30). Lifecorder EX steps compared against observed steps had accuracy of $\pm 1-3\%$ (31). Agreement analysis has shown an ICC of 0.72 for a single day compared to mean steps for seven days (32). This is equivalent to an ICC of 0.80 for three days of steps (32,33). Therefore, at least three days of step data per week minimum is commonly considered sufficient to provide an estimate of weekly PA (32).

The Lifecorder EX holds seven days of data, records time, date, and total steps and automatically resets to 0 steps at midnight. Data outputs are exported from Lifecorder EX for analysis with a USB port. Participants wore a blocked (no data displayed) accelerometer at the waist, midline with their thigh for seven days to count their daily steps. The accelerometer was pre-programmed with the person's gender, height, weight, and age. They were instructed to not change their PA. All participants had at least three days of data per week. The numbers of days the participants wore the pedometers were: 3 days ($n=6$), 4 days ($n=2$), 5 days ($n=1$), 6 days ($n=10$), and 7 days ($n=91$). Steps walked in a day were summed and divided by the number of accelerometer wear days. The step counts per day were classified on previously established normative data as: <5,000 steps=sedentary; 5,000–7,499 steps=low active; 7,500–9,999 steps=somewhat active; 10,000–12,499 steps=active; and 12,500 steps=highly active (34).

Data Collection Procedure

The study was approved by a university Institutional Review Board. Based on participants' preference, the interviews were conducted either at the religious institution ($n=83$, 75%) or at participants' homes ($n=27$, 25%). After obtaining informed consent, blood pressure, height, weight, and waist circumference were measured, and questionnaires were self-administered in the language of the participants' choosing. Participants were given the option to read the questionnaires themselves or have them read to them. After completing questionnaires, the results of the physical measures, blocked accelerometers, and written instructions in Hindi or English on wearing the accelerometers for the following seven days were provided. A time and location for a second visit were identified for retrieving the accelerometer. At the second visit, participants were given the results of their step-count

information, recommended PA guidelines, step recommendations, and \$10 in appreciation of their time and effort.

Data Analysis

Descriptive statistics (frequencies, means, and standard deviations) were calculated for demographics and lifestyle PA. Chi-square for categorical variables and Student's *t* tests for continuous variables were used to examine differences between men and women. Pearson correlation coefficients were computed between the self-reports and objective measure of PA.

Results

Participant Characteristics

Table 1 shows the participant characteristics by gender. The mean age was 53 years (Table 1); most were married (92.7%), had children (97.2%), and were currently employed (72.7%). Over half had a college degree, and more than half (67.2%) had an annual household income of \$50,000. Approximately one-third were Christians, Hindus, and Sikhs, respectively. Forty-three percent elected to respond in Hindi. The mean score for global health ($M = 3.19$) indicated moderately good physical health. There were no significant differences in any of the participant characteristics by gender.

Types of Physical Activity

Table 2 shows the most frequently performed LTPA, HPA, and OPA. Across all domains, the most frequently reported activities were either light- or moderate-intensity. Walking fast or briskly for exercise was the most frequently reported LTPA; others included walking leisurely for exercise or pleasure, stretching/flexibility exercise, yoga or tai chi, jogging/running, walking uphill/hiking uphill, riding bicycle/stationary cycle, and dancing. Jogging/running was the one LTPA performed by a significantly higher percentage of men than women ($p=.05$).

Two HPA (light work around the house and light gardening) were performed by a significantly higher percentage of women than men ($p=.05$) and one activity by a significantly higher percentage of men than women (heavy gardening; $p=.01$). The most frequently reported OPAs were sitting light work, walking not carrying anything heavier than a briefcase, standing light work, standing light to moderate work, and walking carrying 2–25 pounds. There were no significant differences between men and women on any of the most frequently performed OPAs.

Time and Intensity of Physical Activity

There was no significant difference between men and women in minutes/week in any intensity of LTPA (Table 3). Compared with men, women on average spent significantly more minutes/week in all-intensity ($p=.05$) and light-intensity HPA ($p=.01$), and men spent more time in moderate-intensity HPA ($p=.05$). Neither men nor women performed any vigorous-intensity HPA. On average, participants worked 40 hours per week (men 39 hours

vs. women 41 hours [no significant difference]) in all-intensity OPA. On average, women spent more time in moderate- to vigorous-intensity OPA ($p=.05$).

About half (51.8%) of the participants met the recommended PA guidelines (150 minutes moderate-intensity or 75 minutes vigorous-intensity) through LTPA, with no significant difference between men (51.2%) and women (52.2%). Less than one-fourth (20%) obtained the recommended PA guidelines through HPA, with no significant difference between men (26.8%) and women (15.9%). Over 50% (57.3%) of the participants met the recommended PA guidelines of 150 minutes of moderate-intensity activity through OPA, with no significant difference between men (65.9%) and women (52.2%).

On average, participants' daily number of steps was 6904.3 ($SD=3388.1$), with no significant difference between men and women (Table 3). Based on the Tudor-Locke and Bassett step count cutoff points (34), 37.7% of women and 22% of men were sedentary; 39.0% of men and 31.9% of women were lowly active; 19.5% of men and 11.6% of women were somewhat active; and 19.5% men and 18.8% women were either active or highly active. The only significant correlations between self-reported PA and step count were for moderate to vigorous LTPA (all participants $r=.201$; women $r=.298$) and all-intensity LTPA (women $r=.296$).

Discussion

The uniqueness of this study is that it includes objective accelerometer data that captures lifestyle walking, and there is a self-report measure of PA that provides the context for PA. To our knowledge, this is one of the first studies to describe the PA of SAIs in this depth. Also, the use of translated material provided an opportunity to reach a large number of SAIs who were not bilingual.

The time spent in all-intensity LTPA was higher in these SAIs (462.4) than in predominantly midlife Korean immigrants aged $M=55.8$ years (282.6) and lower than in older Latino immigrants aged 50–70+ years (521.5) in the same urban area and using the same measure (19, 35). However, the average minutes/week spent in moderate/vigorous-intensity LTPA for these SAIs (277.8) as higher than for the Koreans (164.9 minutes) (19) and Latinos (221.7 minutes) (35). There is evidence from prior studies that LTPA is higher among those with a higher education (36). Over 69.1% of these SAIs had a college degree or higher education, whereas only 11.5% of the Latinos and 47.1% of the Koreans did. This may account for the differences.

Prior research indicated that LTPA is generally higher in men than women (19, 37). Surprisingly, there was no difference between the number of minutes these SAI men and women spent in moderate to vigorous LTPA per week or in the percentage of men (51.2%) vs. women (52.2%) meeting the required weekly minutes of PA through LTPA. There is evidence suggesting that some SAIs, both men and women, find the embodied experience of PA (such as sweating, increased heart rate, and breathlessness) unpleasant and frightening (38). SAI men and women alike had a profound dislike of going outside in cold, wet, and windy weather (38). The participants in this study resided in an area of the country known

for cold and windy weather, which differs dramatically from their country of origin. This may have affected the amount of moderate-intensity LTPA participated in by our subjects.

Like immigrant Koreans and Latinos (19, 35) in the same metropolitan area, walking fast for exercise and walking leisurely were the most frequently reported LTPAs. All three immigrant groups had access to similar environmental resources such as sidewalks. Consistent with a prior study of SAIs (39), among the most frequently engaged in LTPAs were yoga and jogging/running.

The self-reported average minutes/week for moderate HPA was higher in these SAIs (92.86) than Latinos (54.8) (35) and Koreans (46.9) (19). HPA fell along traditional gender lines, with women performing more light housework and light gardening, but men performing more heavy housework and heavy gardening. Although women spent more time overall in HPA, and men spent more time in moderate-intensity HPA, there was no significant difference between the genders in meeting guidelines for PA through this activity. The earlier study's Korean women worked long hours outside the home (59 hours per week), which may account for less time spent in HPA than these SAI women. The 45 (55%) SAI women who worked on average worked 41.17 hours/week. Nonetheless, less than one-fourth of these SAIs met the guidelines for PA through HPA.

On average, the SAIs who were employed worked 40.3 hours per week. This is similar to the average number of weekly work hours reported by a U.S. study of male (46 hours/week) and female white collar workers (43 hours/week) (40). On average, SAIs spent 15.2 hours on moderate- to vigorous-intensity OPA per week, suggesting that some were working in blue collar positions that required more physical work than white collar jobs. In fact, the women who worked spent more time performing moderate-intensity activities at work than men. SAI men often come to the US for professional education and jobs, but women who accompany their partners often do not work or assume lower-skilled work positions (41). Overall, however, approximately half of the participants were sufficiently active through moderate- to vigorous-intensity OPA, with no difference between men and women. Because a large portion of SAIs' daily lifestyle activity is spent on OPA, this domain of PA may be the source of most of their daily PA, and this information is essential in formulation of PA interventions for this target population.

The average number of steps taken by SAI participants was 6904.3 (men=7056, women=6813), which is in the low active classification (34) and did not differ by gender. This is consistent with a prior study of SAIs residing in New Zealand (men $M=6982$, women $M=5159$); however, in that study, step count was significantly higher in men than women (16). SAIs' average daily step count is similar to non-immigrant Whites and non-Whites (6319) (18) but lower than Korean immigrants (8,010) (19). Only self-reported LTPA significantly correlated with step counts. Although self-reported PA and accelerometers measure different dimension of PA, they provided consistent findings. The higher percentage of participants who reported walking reported it in LTPA rather than in the other two PA dimensions.

Despite this study's many strengths, it is not without limitations. We recruited participants primarily from religious institutions, and the sample might not have been representative of the SAI population. Also, data were collected primarily in the spring and summer months. We do not know how activity changes through the seasons for SAIs. The cross-sectional nature of the study and small sample size precluded doing more sophisticated statistical modeling.

Conclusions

The SAIs in this study were primarily highly educated and had time to devote to leisure time pursuits, but most of their LTPA was light-intensity. Only half of both SAI men and women met the recommended PA guidelines through LTPA. Furthermore, accelerometer data showed that their overall lifestyle walking was in the low active classification. Also, women tended to participate in more HPA than men, but, as with LTPA, this was primarily light-intensity. Slightly more than half of the women worked, and it appears that these women may be obtaining more moderate-intensity OPA than men. This information could be used by researchers to design PA interventions for SAIs.

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Table 1

Participant Characteristics by Gender

	Total (N = 110)	Males (n = 41)	Females (n = 69)
Demographics			
Age, mean (SD)	53.0 (7.6)	53.6 (8.4)	52.5 (7.2)
Age at immigration, mean (SD)	32.9 (10.7)	33.9 (11.9)	32.4 (9.9)
Years since immigration, mean (SD)	20.1(10.5)	19.9 (10.5)	20.2 (10.6)
Education, college degree or higher, n (%)	76 (69.1)	27 (65.8)	49 (71.0)
Marital status, married, n (%)	102 (92.7)	40 (97.6)	62 (89.9)
Children, have children, n (%)	107 (97.2)	41 (100)	66 (95.7)
Employed, n (%)	80 (72.7)	33 (80.5)	47 (68.1)
Household yearly income, n (%)			
Less than \$50,000	32 (29.0)	14 (34.1)	18 (26.1)
\$50,000 to \$99,000	33 (30.0)	10 (24.4)	23 (33.3)
\$100,000 or more	41 (37.2)	16 (39.0)	25 (36.2)
Religion, n (%)			
Christian	34 (30.9)	15 (36.5)	19 (27.5)
Hindu	38 (34.5)	10 (24.3)	28 (40.6)
Sikh	38 (34.5)	16 (39.0)	22 (31.9)
Questionnaires language, n (%)			
Hindi	48 (43.6)	17 (41.5)	31(44.9)
English	62 (56.4)	24 (58.5)	38 (55.1)
Current health, mean (SD)	3.19 (.92)	3.20 (.94)	3.17 (.9)

* Significant at the 0.05 level (2-sided).

Table 2

Most Frequently Reported Physical Activities by Males and Females

Physical activities	MET	Total (N = 110)				Males (n = 41)		Females (n = 69)	
		N	%	N	%	N	%	N	%
Leisure-time physical activity									
Walk fast for exercise	3.5	58	52.7	21	51.2	37	53.6		
Walk leisurely	2.5	40	36.4	11	26.8	29	42.0		
Stretching/flexibility exercise	2	40	36.4	17	41.5	23	33.3		
Yoga or tai chi	2	31	28.2	8	19.5	23	33.3		
Jog/run *	7	21	19.1	12	29.3	9	13.0		
Walk uphill/hike uphill	6	20	18.2	7	17.1	13	18.8		
Ride bicycle/stationary cycle	4	15	13.6	7	17.1	8	11.6		
Dancing	4.5	11	10	3	7.3	8	11.6		
Household physical activity									
Light work around the house *	2.5	83	75.5	26	63.4	57	82.6		
Light gardening *	2.25	64	58.2	18	43.9	46	66.7		
Heavy gardening **	4	29	26.4	17	41.5	12	17.4		
Heavy work around the house	3	23	20.9	12	29.3	11	15.9		
Occupational physical activity									
Sitting light work	1.5	67	60.9	30	73.2	37	53.6		
Walking not carrying anything heavier than briefcase	3.5	39	35.5	21	51.2	18	26.1		
Standing light work	2.5	38	34.5	17	41.5	21	30.4		
Standing light to moderate work	3	15	13.6	6	14.6	9	13.0		
Walking carrying 2–25 lbs	4.5	14	12.7	7	17.1	7	10.1		

Note. MET = metabolic equivalent of task, defined as the ratio of the associated rate for a specific activity divided by the resting metabolic rate.

*** Significant at the 0.01 level (2-sided).

* Significant at the 0.05 level (2-sided).

Table 3
 Minutes per Week Spent in Light, Moderate, and Vigorous Leisure-time (LTPA), Household (HPA), and Occupational (OPA) Physical Activity, Step Counts by Gender, and Differences by Gender

	Total			Male			Female		
	N	Mean (SD)	(SD)	N	Mean (SD)	(SD)	N	Mean (SD)	(SD)
Self-report (min/week)									
All-intensity									
LTPA	110	462.4	501.9	41	381.9	415.65	69	510.2	544.01
HPA	110	362.7	329.7	41	283.17	290.78	69	410	344.19*
OPA ^a	81	2420	881.1	36	2356.6	684.1	45	2470.6	1016.56
Light-intensity									
LTPA	110	184.6	243.8	41	129.5	201.8	69	217.3	261.59
HPA	110	269.86	254.43	41	147.8	170.05	69	342.39	269.14**
OPA	81	1506.66	1099.04	36	1633.33	865.34	45	1405.33	1255.73
Moderate- to vigorous- intensity									
LTPA	110	277.8	337.2	41	381.95	415.6	69	510.2	544.01
HPA	110	92.86	159.14	41	135.36	166.6	69	67.60	150.10*
OPA	81	913.33	794.1	36	723.33	627.1	45	1065.3	883.40*
Step counts/day	110	6904.3	3388.1	41	7056.6	3350.2	69	6813.8	3431.7

^aNote. N 81 = only 81/110 were employed in the previous 12 months.

** Significant at the 0.01 level (2-tailed).

* Significant at the 0.05 level (2-tailed).