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Lifestyle Physical Activity Behavior of Korean American Dry Cleaner Couples

Ju Sukyung, Ph.D.¹, Professor JoEllen Wilbur, PhD, APN, FAAN², Lee Eunice, PhD, RN¹, and Miller Arlene, PhD, FAAN²

¹College of Nursing, University of Illinois at Chicago, Chicago, IL USA

²College of Nursing, Rush University, Chicago, IL, USA

Abstract

Objective—The purposes of this study were to: (1) describe and compare lifestyle physical activity (leisure-time, household, and occupational physical activity), using both self-report and an objective measure of step counts, in self-employed Korean American married couples working together at dry cleaners, and (2) examine the relationship between self-report and objective measures of physical activity.

Design and Sample—Seventy couples participated in this cross-sectional, descriptive, face-to-face interview survey.

Measures—Two self-reports (28-item Community Healthy Activities Model Program for Seniors Physical Activity Questionnaire and Tecumseh Occupational Physical Activity Questionnaire) and one objective measure (New Lifestyles-800 pedometer) were used.

Results—The husbands spent significantly more time than their wives in moderate- to vigorous-intensity leisure-time physical activity (207 vs. 122 minutes/week) and occupational physical activity (2,585 vs. 1,065 minutes/week). Most couples (91%) met recommended levels of physical activity based on their occupational physical activity. Pedometer steps correlated significantly only with leisure-time physical activity.

Conclusions—Study findings suggest that to increase physical activity in Korean American couples who work in a small business, moderate-intensity lifestyle physical activity interventions across leisure-time, household, and occupational physical activity will be more successful than traditional leisure-time interventions. In addition, results suggest that there is a need for interventions that target both members of the married couple.

Keywords

physical activity; pedometer; Korean American couples

Background

Many adults in the United States do not engage in regular physical activity, despite its well-known health benefits. The Behavioral Risk Factors Surveillance System surveys from 2001 and 2003 indicated that, on average, only 38.6% of Asians and Native Hawaiians or other Pacific Islanders met recommended levels of lifestyle physical activity, compared with 45.8% of the total U.S. population (Centers for Disease Control and Prevention, 2004).

There are no known U.S. national statistics on immigrants and physical activity, but we can glean understanding from the Canadian Community Health Survey of over 171,513 adults (Tremblay, Bryan, Perez, Arden, & Katzmarzyk, 2006). They found that fewer recent (< 10 years since immigration) East/Southeast Asian immigrants (14%) reported participation in moderate- to high-intensity leisure-time physical activity (LTPA) than non-immigrants of all ethnicities (24%). The prevalence of East/Southeast Asian immigrants who reported moderate- to high-intensity LTPA increased over time since immigration, but remained lower than non-immigrants. Thus, activity for Asians living in the United States is lower than the general population and may be even lower when Asians are recent immigrants.

Korean Americans comprise one of the fastest growing immigrant Asian groups, with more than a tenfold increase from 1970 to 1990, and are the fifth largest of the 11 Asian American subgroups (U.S. Census Bureau, 2004). Our knowledge of physical activity in Korean Americans, based on studies that examined their LTPA only (Choi, Wilbur, Miller, Szalacha, & McAuley, 2008; Hofstetter et al., 2008; Yang et al., 2007), suggests that their LTPA is lower than the dominant U.S. culture. Since a large portion of Korean Americans are recent immigrants (Hofstetter et al., 2008), LTPA may be a luxury they cannot afford.

Measuring only LTPA may underestimate the total amount of physical activity in immigrant populations. Total lifestyle physical activity (including LTPA, household [HPA], and occupational [OPA]) that is both planned or unplanned (Dunn, Andersen, & Jakicic, 1998) may be more appropriate to examine than LTPA alone. Studies that have assessed physical activity levels of Korean Americans have been at the individual level and primarily focused on women because women tend to be less active than men (Choi et al., 2008; Im & Choe, 2001; Yang et al., 2007). Indeed, a larger percentage of Asian men (41.0%) than women (35.8%) reported participation in lifestyle physical activity that met or exceeded recommended levels (Centers for Disease Control and Prevention, 2004). Despite evidence that married Korean women's health behaviors, such as smoking, drinking, regular medical check-up, diet, and exercise, are influenced by their husbands (Chun, Doyal, Payne, Il-Cho, & Kim, 2006) and the importance of spousal support in maintaining health behaviors (Yang & Kim, 2001), to date no studies have examined physical activity in Korean American couples.

First-generation immigrant Korean Americans show the highest self-employment rate (19.9%) for all ethnic groups, with dry cleaning services and restaurants the most frequently held small businesses (Y. M. Lee, 2006). Dry cleaning services are often operated by couples; thus, these businesses provide an opportunity to gain an understanding of lifestyle physical activity of Korean American couples working together.

A gap in our knowledge of physical activity in Korean Americans is partly due to reliance on self-report measures (Choi et al., 2008; Hofstetter et al., 2008; Yang et al., 2007). Self-report measures of physical activity are subject to problems with recall and fail to adequately capture spontaneous, incidental, or intermittent activities, such as household chores and walking. Objective measures such as accelerometers/pedometers have proven useful and minimally intrusive for measuring accumulated physical activity (Tudor-Locke et al., 2004). Therefore, a combination of motion sensor (i.e., pedometer for measuring steps) and self-report measures may enhance the rigor of research by quantifying physical activity behavior and providing the context and type of physical activity behavior.

Research Questions

The purposes of this study were to: (1) describe and compare lifestyle physical activity (LTPA, HPA, and OPA), using both self-report and an objective measure of step counts, in

self-employed Korean American married couples working together at dry cleaners, and (2) examine the relationship between self-report and objective measures of physical activity.

Methods

Design and Sample

The study design was descriptive and cross-sectional. A convenience sample of 70 Korean immigrant couples residing in the Chicago metropolitan area participated in the study between August 2008 and April 2009. The inclusion criteria were aimed at the couple: born in Korea and immigrated to the United States, working with spouse at dry cleaners, and no disabilities that would prohibit them being physically active.

Recruitment—All recruitment materials were translated into Korean by the first author. The layout and pictures were reviewed by the Multiethnic Community Advisory Board of the Center for Reducing Risks in Vulnerable Populations at the University of Illinois at Chicago (Dancy, Wilbur, Talashek, Bonner, & Barnes-Boyd, 2004), which included three Korean immigrant members as well as representatives of other immigrant groups (e.g., Latino, South Asian Indian).

Three recruitment strategies were used: (1) the Korean American Dry Cleaners Association of Greater Chicago membership lists, (2) advertisements, and (3) social networking

The Korean American Dry Cleaners Association of Greater Chicago member list included 1,298 owners. Of these, the 454 drop-off cleaners were excluded because those establishments are usually operated by one person (B. M. Park [President of the Korean American Dry Cleaners Association of Greater Chicago], personal communication, July 21, 2008). Systematic random sampling (Dillman, 2007) of every fourth member of the 844 remaining dry cleaners resulted in 211 dry cleaners. To test completeness of the list, an initial group of 28 dry cleaners located in the city of Chicago were sent introductory letters in Korean which explained the purpose of the study, inclusion criteria, a telephone number to call to learn more about the study, and an indication that the researcher would follow up with a phone call two weeks after receipt of the letter. Only five listings had correct addresses and working telephone numbers (8 letters returned undeliverable and 15 disconnected telephones). The president of the Korean American Dry Cleaners Association of Greater Chicago confirmed that the listing was not up to date. Then he identified 52 active members on the list with known complete mailing information. Introductory letters were sent to all 52 members, and follow-up phone calls were made. Nineteen couples (3 from random sampling and 16 from known active members) were recruited from the Korean American Dry Cleaners Association of Greater Chicago membership list.

For recruitment through advertising, the authors and three graduate students distributed flyers to a convenience sample of 22 dry cleaners near their homes in Chicago. Follow-up phone calls were made by the first author. Notices announcing the study were also placed on the Federation of Korean Dry Cleaners Association Web site and in one of Chicago's Korean newspapers. Sixteen couples (14 from study flyers, 1 from Web site, 1 from newspaper) were recruited through advertisements.

Recruitment through social networking among the study participants was also used. At the completion of each interview, participants were asked to recommend the study to other Korean American couples who operated a dry cleaning business. Study participants called 56 other dry cleaner couples to inform them of the study and gain permission for the first author to call them to further explain the study. Thirty-five couples were recruited through social networking. Overall, 70 couples were included in the study.

Data collection procedures—The study was approved by the Institutional Review Board of the University of Illinois at Chicago. Eligible couples signed individual informed consent documents prior to questionnaire administration at the dry cleaners. Although study consents and questionnaires were available in both Korean and English, all participants preferred Korean. The questionnaire was administered in a face-to-face interview. To reduce spousal influence on questionnaire responses, each husband and wife were interviewed separately. The couple chose a quiet location within the dry cleaners for the interview. While one member of the couple was being interviewed, the other tended to customers. After completing the questionnaire interview, participants were given instructions on the use of a taped (blinded) pedometer. They were instructed to put it in a horizontal position on their belt or waistband halfway between umbilicus and hip when they got up in the morning and remove it at bedtime every day for seven consecutive days. They were instructed to remove it during waking hours only if they were in water. They were given a padded envelope with priority mail stamps in which to return the pedometer after the seven days. After returning their seven days' data, each participant was mailed their pedometer results along with a different pedometer to keep as their own as a reward.

Measures

The demographic items were age, educational level, number of children, number of employees, number of stores, years living in the United States, and age at immigration. Two self-reports and one objective measure (pedometer) were used to assess lifestyle physical activity.

Self-reported physical activity—The LTPA and HPA were measured with the 28-item Community Healthy Activities Model Program for Seniors Physical Activity Questionnaire (Resnicow et al., 2003). The 28-item version includes daily activities that are physical in nature (e.g., gardening, housework), physical recreational activities (e.g., golf, tennis), and exercise (e.g., walking, bicycle, stretching). The frequency of activity is assessed in “times per week,” and duration is classified using five categories ranging from “less than 15 minutes per time” to “more than one hour per time.” Minutes per week for each activity are calculated by multiplying frequency by duration. Previous studies using the original questionnaires with older adults found two-week test-retest reliability for total activity and moderate-intensity activity of 0.65 and 0.76 (Harada, Chiu, King, & Stewart, 2001) and found six-month reliability for total and moderate-intensity activities of 0.66 and 0.76 (Stewart et al., 2001). Validity of the 28-item Community Healthy Activities Model Program for Seniors Physical Activity Questionnaire was supported in a study of young and middle-aged African American adults by significant but small correlations (0.16–0.32) with estimated VO_2 max and was reported to be stronger for individuals with lower income (0.56–0.75) (Resnicow et al., 2003).

OPA was assessed by the Tecumseh Occupational Physical Activity Questionnaire (Ainsworth, Jacobs, Leon, Richardson, & Montoye, 1993). This instrument asks about 14 occupational activities, ranging from sitting and doing light work to pushing objects weighing more than 75 pounds, and the average minutes per week that the respondent spent on each. Minutes per week for each activity are calculated by multiplying frequency (hours/60) by duration. Reliability was shown by a significant one-month test-retest correlation (.83) in a study of healthy Caucasian men and women (Ainsworth et al., 1993) and a significant two-week test-retest correlation (.73) in midlife Caucasian and African American women (aged 35-60) participating in a bone density study (Holm, Dan, Wilbur, Li, & Walker, 2002). Validity was demonstrated by significant correlations with a 7-day occupational activity record (.46) and with an accelerometer (.35) in 46 healthy women aged 20 to 60 (Ainsworth, Richardson, Jacobs, Leon, & Sternfeld, 1999).

The *2008 Physical Activity Guidelines for Americans* (2008 Guidelines) by the U.S. Department of Health and Human Services were used as guidelines for the recommended level of lifestyle physical activity. Participants were classified as physically active if they reported: (1) at least 2 hours and 30 minutes (150 minutes/week) of moderate activity every week, (2) at least 1 hour and 15 minutes (75 minutes/week) of vigorous activity every week, or (3) an equivalent combination of moderate-intensity and vigorous-intensity activity per week (U.S. Department of Health and Human Services, 2008).

Objective measurement of physical activity—Physical activity was objectively measured by a pedometer counting steps per day. The New Lifestyles-800 pedometers use an accelerometer-type mechanism consisting of a horizontal beam and a piezoelectric crystal (a technology with no moving parts). The advantage of the piezoelectric pedometer over the less expensive spring-levered pedometer is that it was shown not to be affected by increasing BMI or circumference of the waist and hip (Crouter, Schneider, & Bassett, 2005). Walking causes the piezoelectric crystal to generate voltage proportional to the acceleration. The voltage oscillations are used to record steps. The New Lifestyles-800 has the ability to store seven days' worth of step counts and automatically resets itself to 0 steps at midnight. The New Lifestyles-800 uses the same piezoelectric mechanism as the New Lifestyles-2000. No significant difference was found between step counts as measured by the New Lifestyles-2000 pedometer and a criterion pedometer, which showed accurate detection of steps in previous validation studies, with free-living young and middle-aged adults (Schneider, Crouter, & Bassett, 2004). In addition, the intramodel reliability (among four pedometers of a single model) for New Lifestyles was exceptionally high (Cronbach's alpha = 0.995) (Schneider, Crouter, Lukajic, & Bassett, 2003). Based on previously published step count normative data, counts per day were classified 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" (Tudor-Locke & Bassett, 2004).

Three days or more of pedometer data per week are considered sufficient to provide an estimate (accounting for almost 90% of variance) of weekly physical activity (Tudor-Locke et al., 2005). Tudor-Locke and colleagues (2005) suggested that Sunday step counts are relatively less important. For this analysis, we excluded the Sunday steps. Step data were obtained by transcribing them from the pedometer with the date and day, excluding Sundays. Nine participants had no available step data due to losing the pedometer (n = 2) or no data shown on the returned pedometer (n = 7). Among the remaining 131 participants, 28 participants (13 husbands and 15 wives) had fewer than three days of step data. We noted that for most of those with missing data (18/28), the days were consecutive and at the beginning of the seven-day period. This suggested that because the New Lifestyles-800 only stores 7 days of steps and automatically resets, the early days were lost either when the participant delayed mailing the pedometer back or in the delivery process. Additional missing days can be attributed to the participants not wearing the pedometer all days. Step data for the 48 couples who had three or more days of step data for both the husband and the wife were included in the analyses. The number of days of step data for men and women respectively were: 3 (n = 9, 15), 4 (n = 13, 14), 5 (n = 13, 13), and 6 (n = 13, 6).

Translation—A modified committee method was used for the translation of demographic and self-report measures of physical activity. A strength of this translation method is that it involves consensus among bilinguals, and allows examination of nuances in the meanings of individual items (Harkness & Schoua-Glusberg, 1998). In this study, a committee of three bilingual translators (including the first author), all of whom spoke Korean as their primary language and all of whom had at least a master's degrees in nursing, translated the questionnaires independently from English into Korean. Next, the translators met together in a reconciliation session, moderated by the bilingual first author, to discuss discrepancies

across the three translated versions. During the reconciliation session, the translators had the opportunity to discuss alternative terms, reducing the likelihood of personal or regional idiosyncrasies. For example, differences were found among the versions in the selection of Korean terms related to “physical activity” or “being physically active.” The translators arrived at a consensus and created an integrated translation of the questionnaire. The committee method was then optimized by adding a group of other bilingual native Korean speakers for additional translation checking (Schoua-Glusberg, 1994). Three Korean American women and one man, all of whom had lived in the United States for more than 20 years and held various occupations, reviewed the questionnaire to assess the accuracy and clarity of the translation and ease of instrument administration. None of them had questions or additional recommendations, and all agreed on the acceptability of the final version of the translated questionnaire.

Analytic Strategy

Descriptive statistics were calculated for demographics and lifestyle physical activity. Paired *t* tests for continuous variables and McNemar’s tests for dichotomous variables were used to examine differences between husbands and wives. Pearson’s correlation was used for the relationship between self-reports and objective measure of physical activity. Lastly, effect sizes (Cohen, 1988) were determined for differences between the husbands and wives on physical activity measures to assess the adequacy of the sample size.

Results

Participant Characteristics

The mean age of the participants was 55.8 years (Table 1). Husbands were significantly older than wives (57.9 vs. 53.7 years old) and older in age at immigration (36 vs. 31.8 years). Education level differed significantly between husbands and wives (McNemar’s test, $p < .001$). More than half of the husbands (58.6%), but only 35.7% of wives, had completed college. Participants had lived in the United States from 2 to 38 years, with most participants (87.8%) living in the United States for 10 years or more. Fourteen percent of the couples operated their store alone, but the other 86% had from 1 to 13 additional employees. Seventy percent owned only one store. Of those with other stores, the number of stores ranged from 2 to 6.

Types of Physical Activity

Table 2 shows the activities that were performed by at least one of the spousal pair in 10% or more of the couples. Across all of the activities, there was a 50% or higher concurrence between the pair. That is, they either both performed or did not perform the activity. Not surprisingly, the activities performed most frequently by both the husband and wife were lighter-intensity activities, such as stretching, light housework and standing light work. There were six LTPAs (golfing with cart, walking leisurely, golfing with carrying equipment, swimming, strength training, and jogging) that were performed by a higher percentage of just the husbands than just the wives. Only two activities (stretching and walking fast) were performed by a higher percentage of just the wives than the just the husbands. For 24% or more of the couples, just the husband did the heavier housework such as heavy gardening and working on a car, while for more than 20% of couples light housework and light gardening were done by just the wife. Examination of the OPAs with a metabolic equivalent of task score greater than 3 revealed that three activities (standing light/moderate, standing moderate work, and standing or walking carrying objects 25-44 pounds) were performed in couples by a higher percentage of just the husband than just the wife. However, two additional higher-intensity activities (walking carrying less than 2

pounds and walking carrying 2-25 pounds) were performed in couples more frequently by just the wife than just the husband.

Time and Intensity of Physical Activity

Compared to their wives, husbands spent significantly more minutes per week in all-intensity LTPA ($p = .002$) and OPA ($p = .008$). Compared to their husbands, wives spent significantly more minutes per week in all-intensity HPA ($p < .001$). On average, compared to their wives, the husbands spent more minutes per week in moderate- to vigorous-intensity LTPA, HPA and OPA (Table 3).

Thirty-three (47.1%) husbands and 24 (34.3%) wives were sufficiently active in their LTPA to meet the 2008 Guidelines (U.S. Department of Health and Human Services, 2008). Examination of the 70 couples revealed that in 25.7% the husband only, in 12.9% the wife only, and in 21.4% both the husband and wife met the guidelines based on LTPA. In 40%, neither the husband nor wife met the guidelines. Eleven (15.8%) of the husbands and 4 (5.8%) of the wives were sufficiently active in their HPA to meet the 2008 Guidelines. Examination of the 70 couples revealed that in 12.9% the husband only, in 2.9% the wife only, and in 2.9% both the husband and wife met the guidelines based on HPA.

On average, the participants worked 64 hours/week (range 18 to 90 hours) (husbands 68 hours vs. wives 60 hours). Sixty-eight husbands (97.1%) and 66 wives (94.3%) were sufficiently active at their workplaces to meet the 2008 Guidelines. Examination of the 70 couples revealed that in 5.7% the husband only, in 2.9% the wife only, and 91.4% both the husband and wife met the guidelines based on OPA.

Step Counts

For the 48 couples with three or more days of step counts, husbands' step counts were significantly higher than those of their wives ($p = .019$) (Table 3). Based on the Tudor-Locke and Bassett (2004) cutoff points, 5 (10.4%) husbands and 10 (20.8%) wives were sedentary (< 5,000 steps/day); 29 (60.4%) husbands and 31 (64.6%) wives engaged in low activity (5,000-7,499 steps/day) or were somewhat active (7,500-9,999 steps/day); and 14 (29.2%) husbands and 7 (14.6%) wives were active ($\geq 10,000$ steps/day). We combined low activity with somewhat active and examined the couple pairs by three groups. This revealed that 54% of the couples were in the same activity group. The only significant correlation between self-reported physical activity and step counts was for all-intensity LTPA in both husbands and wives together ($r = .213$, $p = .031$) and in husbands alone ($r = .286$, $p = .040$) (Table 4).

Effect Sizes

Effect sizes for differences between couple pairs ranged from $d = 0.32$ (Cohen's d) (Cohen, 1988) for HPA to 1.46 for OPA. With 70 couples, power for OPA was greater than .99. The power for LTPA, HPA and step counts/per day was .69, .45 and .62, respectively. Two of the three approached the optimal level of .70.

Discussion

Following an exhaustive search, no other studies were found that compared lifestyle physical activity, including not only LTPA but also HPA and OPA, among Korean American couples. Likewise, no other study was found that examined relationships between subjective and objective measures of physical activity in this population. Findings indicate that, for Korean American couples, a large portion of their daily lifestyle physical activity is

spent in non-LTPA. Most couples worked long hours; thus, a significant portion of their physical activity on self-report was undertaken at work.

Indeed, these Korean American couples worked an average of more than 60 hours/week. This is much higher than that reported in a U.S. study of male (46 hours/week) and female white-collar workers (43 hours/week) (Ainsworth et al., 1993) and a U.S. study of healthy, White, college-educated women (45 hours) (Ainsworth et al., 1999). Examination of self-report time spent in moderate- to vigorous-intensity OPA revealed that although husbands spent more time than their wives, most couples (91%) were meeting the 2008 Guidelines (150 minutes of moderate physical activity per week, 75 minutes of vigorous activity per week, or combination of both) based on their OPA alone. As suggested by Woolin and colleagues (2006), minority populations may be able to reach recommended physical activity levels through non-LTPA.

Examination of self-reported LTPA revealed that 47% of husbands and 34% of wives were sufficiently active through LTPA alone to meet the 2008 Guidelines for physical activity. These are slightly higher than the 33% of multiethnic men and 29% of women from the 2007 National Health Interview Survey (Pleis & Lucas, 2009) and the 23% of predominately young Korean American women in an earlier study (Choi et al., 2008) who met the *Healthy People 2010* objectives (at least 30 minutes of moderate activity 5 or more days per week, or at least 20 minutes of vigorous activity 3 or more days per week). The 2008 Guidelines tend to allow inclusion of more people as physically active than do the *Healthy People 2010* objectives because they removed the frequency and duration requirement (Carlson et al., 2008). The difference between the two criteria may explain the higher portion of the husbands and wives in this study being sufficiently active.

Similar to a prior study of 179 Caucasian and African American couples, the husbands were more active in LTPA than their wives (Pettee et al., 2006). Another similarity was in the percent of couples who were concordant with regard to LTPA participation (61% for our study vs. 65%). The husbands and wives in this study reported walking and golfing as among their top activities. The golf finding is similar to a cross-sectional study of Korean midlife women, recruited primarily from churches, who reported golf to be a frequent activity (Yang et al., 2007). Interestingly, golf is a highly regarded sport in Korea, but due to limited land space, the few golf links available are very expensive. The availability and comparatively lower cost make it an appealing sport to Korean Americans.

Overall, similar to other studies (Eyler, 2003; S. K. Lee, Sobal, & Frongillo, 2000), gender differences were found in the HPA and OPA in this sample. The husbands spent more time both in all-intensity and moderate- to vigorous-intensity LTPA and OPA. Wives spent more time in all-intensity HPA; they did less moderate-intensity activity, such as heavy yard work. The HPAs that these couples participated in fell along traditional gender lines.

The average number of steps taken by the Korean American couples per day was 8,010 (husbands 8,382 vs. wives 7,313), which fell in the “somewhat active” classification (7,500-9,999) by Tudor-Locke and Bassett (2004) cutoff points. This was higher than a U.S. sample of young adult men ($M = 7,192$) and women ($M = 5,210$) recruited through random-digit dialing (Tudor-Locke et al., 2004). The concordance of 54% between the spousal pairs (husbands and wives) on their step count activity groups paralleled their concordance on self-reported LTPA (61% vs. 54%). This provides additional evidence that one partner may influence the activity of the other.

The number of hours spent at work suggests that OPA may be the source of most of their daily steps. Surprisingly, however, we found no relationship between self-reported OPA and step counts, which is in contrast to an earlier study of professional, white collar, and blue

collar workers (Steele & Mummery, 2003). This may be partially explained by the large amount of time spent standing and performing light/moderate work. Interestingly, there was only a significant modest relationship between self-reported LTPA and step counts. This is consistent with walking being their most frequently reported LTPA.

The overall highly variable relationship between the self-report and objective measures of physical activity in this study can be explained by the fact that the self-report questionnaires and pedometer data measure different dimensions of physical activity (Corder et al., 2009). For example, self-reported physical activity provides information about types of activity and estimated energy expenditure, while the pedometer records step counts. A strength of self-report measures as used in this study is the comprehensive information provided on the type of LTPA, HPA and OPA performed by Korean couples. The pedometer gives an objective measure of overall step counts for a day, but it does not provide information on the type of activity done. Thus, one of these measures is not inherently better than the other; the outcome of interest will influence the best choice of measure.

A limitation to the New Lifestyles-800 pedometer is that although it has an accelerometer feature, it does not record intensity of physical activity and it is not sensitive to isometric exercise, or activity that involves the upper body (Schneider et al., 2003). A triaxial accelerometer that measures accelerations in anteroposterior, mediolateral, and vertical directions would be better suited to capture upper body movements. Further, it captures both steps and intensity data simultaneously, providing the quality of steps taken (Plasqui & Westerterp, 2007). An additional problem with the New Lifestyles-800 is that it holds only seven days of data and resets each day; thus, data were lost in the mailing process. This can be addressed in future studies by using a device that stores additional days of data, as well as having the capability of being downloaded remotely via a computer to avoid mailing.

A major limitation of the study is the small convenience sample. This sample is homogeneous in ethnicity, job, and residence. Thus, generalizability to other Korean American couples and immigrant groups is limited. Although the power was adequate for OPA and approached it for LTPA and step counts, in order to reach .70 for HPA, a sample of 100 couples (100 wives and 100 husbands) would be required. Future work may need to explore an epidemiological design with larger samples. Further, data are from one point in time, and we do not know if husbands and wives became active together.

In conclusion, these findings suggest that to increase physical activity in Korean American couples who work at a small business, moderate-intensity lifestyle physical activity interventions across LTPA, HPA, and OPA will be more successful than traditional LTPA interventions. In addition, this study also suggests that there is a need for interventions that target both members of the married couple.

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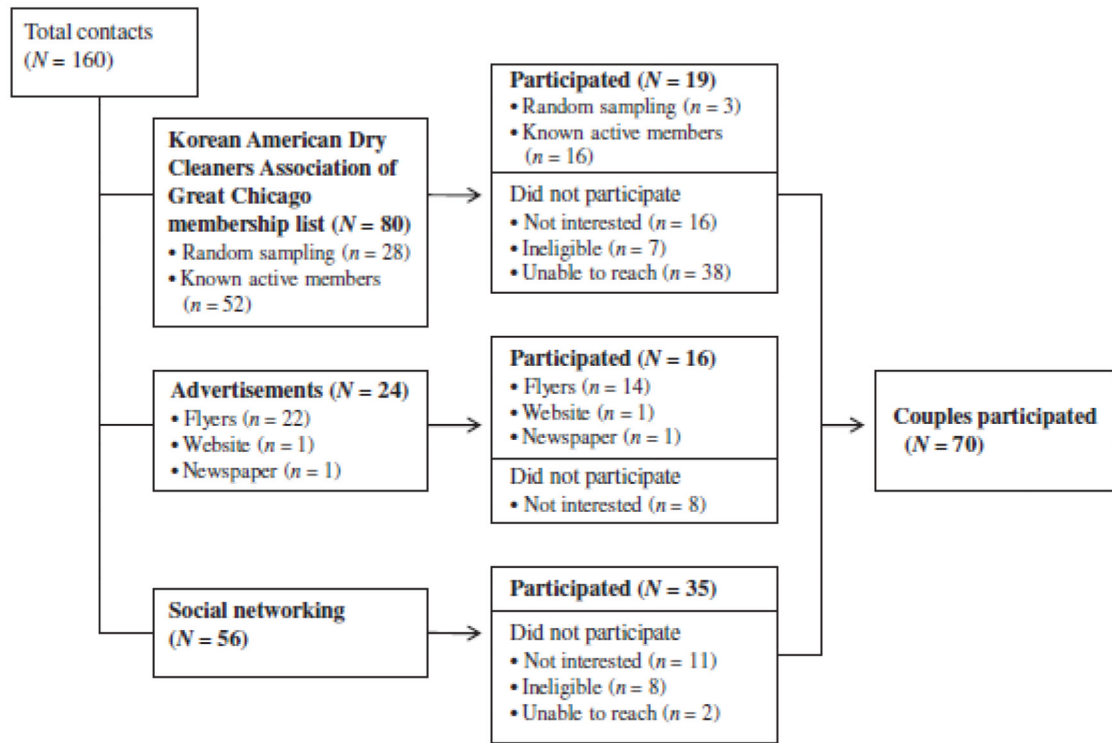


Figure 1.
Recruitment Process

Table 1

Differences of Demographics between Husbands and Wives

	Total (N = 140)	Husbands (n = 70)	Wives (n = 70)	P value
Demographics				
Age, mean (<i>SD</i>)	55.8 (7.6)	57.9 (7.9)	53.7 (6.6)	<.001
Education, <i>n</i> (%)				
Less than high school graduate	7 (5.0)	0 (0.0)	7 (10.0)	<.001
High school graduate	54 (38.6)	21 (30.0)	33 (47.1)	
Some college	13 (9.3)	8 (11.4)	5 (7.1)	
College graduate or higher	66 (47.1)	41 (58.6)	25 (35.7)	
Number of children, mean (<i>SD</i>)	2 (0.8)			N/A
Years living in the United States, mean (<i>SD</i>)	21.94 (8.9)	21.95 (8.9)	21.92 (8.9)	.949
Age at immigration, mean (<i>SD</i>)	34 (9.0)	35.97 (8.8)	31.78 (8.8)	<.001

Note. Paired *t* test for continuous variable (age, years living in the United States, age at immigration). McNemar's test (nonparametric paired two-sample test) for categorical variable (education). *SD* = Standard Deviation.

Table 2
Most Frequently Reported Physical Activities by Both Husband and Wife, Husband Only, Wife Only, or Neither (N = 70 couples)

Physical activities	MET	Both husband and wife n (%)	Husband only n (%)	Wife only n (%)	Neither husband nor wife n (%)
Leisure-time (LTPA)					
Stretching	2	34 (48.6)	10 (14.3)	18 (25.7)	8 (11.4)
Golfing with riding a cart	2	6 (8.6)	10 (14.3)	6 (8.6)	48 (68.6)
Walking leisurely	2.5	6 (8.6)	11 (15.7)	4 (5.7)	49 (70.0)
Golfing with carrying equipment	3	5 (7.1)	15 (21.4)	2 (2.9)	48 (68.6)
Swimming	3	4 (5.7)	8 (11.4)	3 (4.3)	55 (78.6)
Walking fast	3.5	11 (15.7)	10 (14.3)	11 (15.7)	38 (54.3)
Moderate strength training	4.5	4 (5.7)	14 (20)	3 (4.3)	49 (70.0)
Jogging or running	7	4 (5.7)	7 (10)	4 (5.7)	55 (78.6)
Household (HPA)					
Light gardening	2.25	11 (15.7)	12 (17.1)	17 (24.3)	30 (42.9)
Light housework	2.5	54 (77.2)	1 (14)	15 (21.4)	0 (0)
Walking to do errands	2.5	9 (12.9)	8 (11.4)	6 (8.6)	47 (67.1)
Heavy housework	3	5 (7.1)	17 (24.3)	9 (12.9)	39 (55.7)
Working on your car	3	0 (0)	17 (24.3)	1 (14)	52 (74.3)
Heavy gardening	4	1 (14)	19 (27.1)	5 (7.1)	45 (64.4)
Occupational (OPA)					
Sitting, light work (e.g., driving a car)	1.5	5 (7.1)	13 (18.6)	6 (8.6)	46 (65.7)
Standing, light work (e.g., sales work at a counter)	2.5	50 (71.4)	0 (0)	20 (28.6)	0 (0)
Sitting, moderate work (e.g., operating heavy machines)	2.5	1 (14)	4 (5.7)	37 (52.9)	28 (40.0)
Standing, light/moderate work (e.g., light cleaning)	3	12 (17.1)	24 (34.3)	13 (18.6)	21 (30.0)
Standing, moderate work (e.g., lifting up to 50 lbs)	3.5	20 (28.6)	33 (47.1)	7 (10.0)	10 (14.3)
Walking, carrying nothing or something less than 2 lbs	3.5	8 (11.4)	6 (8.6)	13 (18.6)	43 (61.4)
Walking, carrying something	4	24 (34.3)	7 (10.0)	15 (21.4)	24 (34.3)

Physical activities	MET	Both husband and wife n (%)	Husband only n (%)	Wife only n (%)	Neither husband nor wife n (%)
between 2-25 lbs					
Standing, or walking carrying objects 25-44 lbs	5	2 (2.9)	14 (20.0)	0 (0)	54 (77.2)

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

Table 3
Mean, Range, and Standard Deviation for Self-Reported Leisure-Time (LTPA), Household (HPA), and Occupational Physical Activity (OPA), Step Counts, and Differences between Husbands and Wives

	Total		Husbands		Wives		P value
	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range	
Self-report, minutes/week (<i>n</i> = 70 husbands, 70 wives)							
All-intensity							
LTPA	282.6 (270.9)	0-1120	339.7 (304.2)	0-1120	226.4 (221.2)	0-930	.002
HPA	177.3 (183.1)	0-1140	120.7 (122.9)	0-600	233.9 (214.4)	20-1140	<.001
OPA	3710.6 (829.7)	1080-5400	3879.4 (817.1)	1440-5400	3541.7 (813.0)	1080-5040	.008
MV-intensity 3 METs							
LTPA	164.9 (202.4)	0-1110	207.3 (234.5)	0-1110	121.6 (153.4)	0-600	.002
HPA	46.9 (83.7)	0-600	60.1 (77.6)	0-360	33.7 (88.0)	0-600	.060
OPA	1825.3 (1321.5)	0-4680	2585.1 (1333.9)	0-4680	1065.4 (753.3)	0-3600	<.001
Step counts/day (<i>n</i> = 48 husbands, 48 wives)	8009.9 (2784.1)	2537-14490	8381.8 (2594.5)	3965-14118	7312.9 (2814.0)	2537-14490	.019

Table 4
Correlations of Self-Report Measures and Objective Measure (Recorded Step Counts) of Physical Activity

Self-reports	Recorded step counts		
	Total (N = 103)	Husbands (n = 52)	Wives (n = 51)
All-intensity physical activity			
LTPA	.213 *	.286 *	-.037
HPA	-.070	-.028	.023
OPA	.014	.042	-.094
MV-intensity, 3 METs			
LTPA	.190	.234	-.031
HPA	-.036	-.079	-.065
OPA	.143	.070	-.036

*
 $p < 0.05$