Published in final edited form as:

Prev Med. 2006 April ; 42(4): 266–272.

Acculturation and physical activity in a working class multiethnic population

Kathleen Y. Wolin^{a,*}, Graham Colditz^b, Anne M. Stoddard^e, Karen M. Emmons^{c,d}, and Glorian Sorensen^{c,d}

^a Northwestern University, Feinberg School of Medicine, Department of Preventive Medicine, 680 North Lake Shore Drive, Suite 1102, Chicago, IL 60611, USA

^b Channing Laboratory, Brigham and Women's Hospital, Harvard Medical School, Boston, MA 02115, USA

^c Dana-Farber Cancer Institute, Center for Community-Based Research, Boston, MA 02115, USA

^d Harvard School of Public Health, Department of Society, Human Development and Health, Boston, MA 02115, USA

^e New England Research Institutes, Galen Street, Watertown, MA 02472, USA

Abstract

Background—Determinants of physical activity in minority populations remain under-explored. Acculturation is one proposed mechanism for the disparities that exist between racial and ethnic groups in health outcomes.

Methods—This cross-sectional study evaluated the relation of language acculturation and generation in the US since migration with leisure-time and occupational activity. A low-income, multiethnic urban population was recruited from Massachusetts small businesses (SB) ($n = 1725$) and health centers (HC) ($n = 2205$). Baseline data were collected between May 2000 and February 2002.

Results—Individuals with low acculturation reported leisure-time activity 3–5 MET hours/week lower than those who were highly acculturated ($P < 0.05$). Generation predicted leisure-time activity only in SB participants. In the HC, least acculturated participants reported occupational activity 10–12 MET hours/week higher than highly acculturated participants. In SB men, acculturation was inversely associated with occupational activity; in SB women, language acculturation was positively associated with occupational activity. Generation was not predictive of occupational activity.

Conclusion—Language acculturation and generation were positively associated with leisure-time activity. Language acculturation is also associated with occupational activity. Acculturation is important to consider when designing public health interventions.

Keywords

Acculturation; Physical activity; Immigrant

Introduction

In the United States, disparities in physical activity levels between racial and ethnic groups exist with non-Hispanic whites having higher levels of activity than any minority group, even after controlling for socioeconomic status (Anonymous, 2000; U.S. Department of Health and

*Corresponding author. Fax: +1 312 908 9588. E-mail address: kwolin@northwestern.edu (K.Y. Wolin).

Human Services, 1996; Crespo et al., 2000). Despite efforts to encourage activity in the US population, physical activity levels remained stable and below recommended levels throughout the 1990s (Anonymous, 2001, 2003).

Determinants of physical activity in minority populations remain under-explored, yet the disparities in activity levels highlight the importance of identifying barriers to and predictors of physical activity in at-risk groups. Culture and the acculturation process may be partial explanations for differences in health outcomes by race and immigration status (Seefeldt et al., 2002). Recent studies have shown that acculturation is related to disease outcomes and to risk factors for chronic diseases (Cantero et al., 1999; Coonrod et al., 1999; Khan et al., 1997; Myers and Rodriguez, 2003; Sundquist and Winkleby, 2000; Whitfield et al., 2002).

Although becoming more acculturated in the US is generally associated with the adoption of harmful health behaviors, data for the relation with physical activity are mixed, though most suggest a positive association (Cantero et al., 1999; Crespo et al., 2001; Gordon-Larsen et al., 2003; Huang et al., 1996; Lee et al., 2000; Perez-Stable et al., 1994; Stern et al., 1991). Limited data are available on non-Hispanic populations making it difficult to know if and how the effect might differ from culture to culture.

Few studies have examined the relation between acculturation and occupational activity. This gap is especially relevant as lower socioeconomic status individuals have higher levels of occupational activity, and immigrants often fall into lower socioeconomic status groups (Anonymous, 2000; Singh and Siahpush, 2002).

Our purpose in this study is to assess the extent to which acculturation is associated with leisure-time and occupational activity in two low-income multiethnic populations. We hypothesize that more acculturated groups or those who have spent more generations in the US will have higher levels of leisure-time physical activity and lower levels of occupational activity than those who are less acculturated or born outside of the US.

Methods

Study populations

This study includes baseline data collected as part of the Harvard Cancer Prevention Program Project, two randomized controlled prevention trials targeting health behaviors among employees in small businesses and patients in community health centers. We enrolled 1740 individuals employed in small manufacturing businesses in Massachusetts and 2219 patients attending the internal medicine departments of community-based health centers in the greater Boston area (Emmons et al., 2003; Hunt et al., 2003; Sorensen et al., 2003). These venues were selected because they employ or serve multiethnic working class populations (Stoddard et al., 2005). All sampling procedures were fully approved by the relevant human subject committees. Study methods have been extensively documented elsewhere and are briefly reviewed here.

Small business (SB)

We recruited 26 small manufacturing businesses in the Boston area to participate in this study. Eligibility criteria included employing at least 25% of workers who were first or second generation immigrants or people of color, having turnover rate of less than 20% per year and willingness to be randomized to intervention condition. Individual workers were eligible if they were permanent employees, worked over 20 h/week, worked on site at the facility and spoke English, Spanish, Portuguese or Vietnamese. Of 2069 eligible employees, 1740 completed the survey (84% response rate) (Hunt et al., 2003).

Health center (HC)

We recruited 10 multispecialty medical practice centers with 83% of internal medicine providers' patient pools participating. Patients were eligible to be included in the study if they lived in a low-income, multiethnic neighborhood (Emmons et al., 2003), had a well-care or follow-up visit with a participating provider, spoke and read either English or Spanish, had not been diagnosed with cancer, were not employed by any of the participating health centers or worksites and consented to participate in the randomized trial. To enroll, participants had to complete a telephone survey 1 week prior to their scheduled health center visit and consent to participate in the intervention at the time of baseline survey completion (Emmons et al., 2003). Study staff attempted to recruit 8963 potentially eligible candidates. Of these attempts, 2547 (28%) were unreachable. Among the 6414 reached, 867 (14%) were ineligible, 3330 (52%) refused and 2219 (35%) were enrolled. If we assume that 14% of those not reached were also ineligible, the response rate is 29% of those assumed eligible. Baseline data were collected between July 2000 and February 2002.

Measures

Using a semi-quantitative leisure-time physical activity (LTPA) questionnaire, participants reported how often in the last 4 weeks they engaged in eight types of leisure-time activities and other activities that get you at least a little bit out of breath (Emmons et al., 2003; Hunt et al., 2003). Occupational activity (OPA) was defined as hours/week spent doing heavy physical activities at work. To account for duration and intensity of activity, responses were coded into metabolic equivalent hours per week (MET hours/week) (Ainsworth et al., 1993). The instrument has been previously validated (Chasan-Taber et al., 1996; Wolf et al., 1994) and was modified based on pilot testing in this population. In a validation within a random subsample ($n = 83$) of participants, the instrument showed good correlation with accelerometer measured activity ($r = 0.53$). The validation sample size did not allow for within group validation.

We assessed both language acculturation and generation in the US. Participants were grouped into low acculturated, moderately acculturated and highly language acculturated based on their scored responses to questions regarding language preference for reading, language spoken at home and first language (Marin et al., 1987). Participants were also grouped into three generation categories based on their place of birth and parents' place of birth: participants who were not born in the US (foreign born); participants born in the US, but one or both parents were not (first generation); and participants born in the US whose parents were born in the US (second plus generation) (Cuellar et al., 1980). For the purposes of this study, US was defined as the 50 states and District of Columbia only.

Household income was collected in six categories. Median income for worksite or health center was used for missing income data ($n = 380$). Current or most recent job or occupation was self-reported and grouped into three levels: professional/managerial/technical, clerical/sales/service, other (including processing, benchwork, machine trade and miscellaneous job categories), plus an additional category for those not currently employed for pay and no prior job reported. Race/ethnicity was self-reported as white, black, Hispanic, Asian or Pacific Islander (API) or Native American. Respondents could also report more than one group. Native American participants ($n = 20$) were excluded from the analyses. Due to the small number of API participants in the HC ($n = 49$), responses were grouped into four categories (non-Hispanic white, non-Hispanic black, Hispanic and other which includes API and participants reporting more than one group). Participants' age in years was calculated from their reported date of birth.

Analysis

Associations between exposures and outcomes were assessed using linear random effects models with normal errors to account for the non-independent nature of observations where individuals are clustered within a worksite or health center. The regression coefficients (β) from these analyses represent the difference in MET hours/week of physical activity between groups. Data were analyzed with SAS, Version 9 (SAS Institute Inc, Cary, NY) using the mixed model analysis procedure, "PROC MIXED." We considered interactions between gender and both language acculturation and generation. Interactions were considered significant if $P < 0.05$. In analyses where the gender interaction was not significant, we report results from the model without the interaction.

Participants with extreme physical activity values (OPA > 137.25 MET hours/week ($n = 103$) or LTPA ≥ 75 MET hours/week ($n = 183$)) were excluded from analyses due to likely measurement error. Unemployed or retired HC participants ($n = 557$) were excluded from OPA analyses.

Results

Demographic characteristics are reported in Table 1. In HC, LTPA was associated with race ($P < 0.0001$), occupation ($P = 0.009$) and income ($P = 0.0006$). It was also associated with race ($P = 0.02$), occupation ($P = 0.01$) and income ($P < 0.0001$) in SB. OPA was also associated with income in HC ($P = 0.01$) and SB ($P = 0.005$). It was only associated with race in SB ($P = 0.002$).

LTPA

In HC, LTPA increased with increasing language acculturation (16.2, 19.0 and 20.2 MET hours/week for low, moderate and high acculturated), while in SB, moderately acculturated individuals had the highest unadjusted mean levels of activity (26.2 MET hours/week) followed by highly acculturated (23.2 MET hours/week) and then low language acculturated (18.9 MET hours/week) (data not shown). In SB, LTPA increased with increasing generations born in the US; second plus generation had the highest levels (25.1 MET hours/week) and foreign-born participants had the lowest levels (21.6 MET hours/week). In HC, first generation participants had the highest level of LTPA (21.5 MET hours/week) followed by second plus generation participants (20.5 MET hours/week).

SB participants who were least acculturated had significantly lower levels of LTPA than those who were highly acculturated (-3.53 MET hours/week, 95% CI: $-6.67, -0.30$) (Table 2). Language acculturation was also inversely related to LTPA in the HC; least acculturated respondents had 4.87 (95% CI: $-9.44, -0.30$) fewer MET hours/week of LTPA. Additional adjustment for income and occupation attenuated the associations.

Generation predicted LTPA in SB participants, where foreign-born individuals reported 3.22 (95% CI: 5.85, 0.59) fewer MET hours/week of activity than second plus generation participants. The association of generation with LTPA was weaker in the HC participants (-1.64 MET hours/week, 95% CI: $-3.76, 0.48$). Further adjustment for income and occupation attenuated the results.

OPA

Overall, OPA levels were higher in SB than HC. In HC, the unadjusted mean OPA level was highest among least language acculturated (18.8 MET hours/week) and lowest among moderately acculturated (10.2 MET hours/week) (data not shown). In SB, moderately acculturated participants had the highest OPA levels (41.6 MET hours/week) and highly

language acculturated had the lowest (24.1 MET hours/week). OPA decreased with increasing generations born in the US in SB participants; foreign-born participants had the highest levels (37.0 MET hours/week) and second plus generation participants had the lowest levels (24.1 MET hours/week). In HC, levels were similar across groups, but foreign-born participants had slightly higher levels of OPA than the other two groups (13.2 MET hours/week vs. 12.0 MET hours/week for foreign born and 11.6 MET hours/week for second plus generation).

In analyses adjusted for age, sex and race, HC participants who were least language acculturated had significantly higher levels of OPA than the most acculturated (11.70 MET hours/week, 95% CI: 3.27, 20.13) (Table 3). There was no difference in OPA levels between moderately and highly language acculturated participants in the HC (0.86 MET hours/week, 95% CI: -4.49, 6.21). Adjustment for income slightly attenuated the association. There was no significant interaction between gender and acculturation in the HC. However, in the SB, the interaction between acculturation and gender was significant ($P=0.02$ in age, sex, race adjusted model). Men who were least language acculturated reported 17.52 (95% CI: 6.99, 28.05) more MET hours/week of OPA than men who were most acculturated. Women who were least acculturated reported 23.71 (95% CI: -33.61, -13.81) fewer MET hours/week of OPA than women who were most acculturated. There were no differences between highly and moderately language acculturated participants in OPA among men or women. Adjusting for income attenuated the association in men and strengthened the association in women.

In analyses of generation in the SB, first generation participants had OPA levels similar to second plus generation participants (6.09 MET hours/week, 95% CI: -1.79, 13.97). Results were similar for the difference between foreign born and second plus generation participants (5.28 MET hours/week, 95% CI: -1.07, 11.63). This was also true in the HC where both first generation (-0.43 MET hours/week, 95% CI: -4.51, 3.65) and foreign born (2.29 MET hours/week, 95% CI: -1.67, 6.25) had OPA levels not significantly different from second plus generation participants. Further adjustment for income attenuated the associations. The interactions of generation and gender were not significant in either HC or SB.

Discussion

Our results are consistent with most of the limited previous research on the relation between language acculturation and LTPA. Individuals who were less acculturated had lower levels of LTPA. The relation between OPA and language acculturation was in the opposite direction, with higher levels of activity observed among the least acculturated among HC participants and SB men. However, among SB women, language acculturation was positively associated with OPA. Adjusting for income and occupation attenuated the effects. We present both models because we believed, a priori, that socioeconomic status might be both a cause and an effect of acculturation, potentially making these variables intermediates between acculturation and activity.

Current thinking tends to describe acculturation as a multidimensional and multidirectional process which is unlikely to be fully captured by measures that imply movement from one culture to another. However, the complexity of the acculturation process cannot be easily captured in community-based research settings with large sample sizes and concerns about participant burden from overly lengthy surveys. As such, several acculturation scales have been created and validated in different populations, which attempt to capture pieces of the acculturation process; language acculturation is the most widely used measure of acculturation, and is a part of nearly all acculturation scales (Crespo et al., 2001; Marin et al., 1987; Arcia et al., 2001; Barry, 2001; Hazuda et al., 1988; Marin and Gamba, 1996; Wallen et al., 2002). Many studies employ a single measure of acculturation, which tends to be language acculturation (Sundquist and Winkleby, 2000; Wallen et al., 2002), or a combination of a few

simple measures, which includes language acculturation and place of birth or generation (Crespo et al., 2001; Khan et al., 1997; Norris et al., 1996). We recognize that the meaning of acculturation may change in an environment where the numbers of educated immigrants are increasing. However, in this population of low-income working class individuals, we believe that the term is still meaningful. In addition, while US pop culture may increasingly extend beyond US borders, cultural norms regarding health behaviors may be less likely to be influenced and still vary widely.

Several mechanisms for the relation between LTPA and acculturation have been proposed (Crespo et al., 2001; Stodolska, 2002). Additional work responsibilities may preclude time and opportunity for LTPA among less acculturated individuals. Less acculturated individuals may desire LTPA, but may lack information on accessing facilities or the necessary facilities may not exist. Less acculturated individuals may also confront environmental or economic barriers to accessing fitness facilities or safe recreation areas. Individuals who are less acculturated may have smaller social networks and lack others to share activities with. Some groups may value activity and rest differently, believing in the value of rest for health, termed the “rest ethic” (Airhihenbuwa et al., 1995). Finally, less acculturated workers may not feel the need or desire to be active in leisure time given their activity levels at work.

These results support previous research indicating the importance of cultural norms in determining health behaviors and suggest a need to direct LTPA interventions to less acculturated groups. Public health researchers also need to consider that less acculturated individuals may be meeting activity recommendations through non-leisure activity. Thus, studies of the health benefits of OPA, especially among less acculturated groups, may be warranted. Additionally, researchers should consider that less acculturated individuals may be physically tired from occupationally active jobs when attempting to address barriers to LTPA.

Study limitations and strengths

Limitations include reliance on a self-reported, yet validated, LTPA measure. However, we lacked information on moderate and low intensity occupational activities. Language acculturation and generation may have had a different relation with lower intensity OPA. Despite this, examination of the relation between acculturation and heavy OPA was merited as previous research has not adequately considered this potential association. Because of the large number of countries of origin of our participants, we only controlled for the effects of race/ethnicity. While we found no effect modification by race, other research has suggested that racial differences exist in barriers to activity (Heesch et al., 2000). Country of origin differences likely exist within racial and ethnic groups, but small numbers prevented us from examining this. The variation within the mixed ethnicity group and within the combined API/mixed ethnicity group makes drawing specific conclusions about those individuals difficult. However, small numbers prevented us from studying them separately. The HC participant response rate would ideally have been higher, although participation did require a substantial effort on the patients’ part. The baseline survey and subsequent intervention were linked in the HC, meaning participants had to agree to participate in both. This may help explain the number of refusals we received during enrollment. When participation in the intervention study was considered as an eligibility criterion, the response rate was considerably higher (62%). The participation rate of the Centers was very high (100% of those asked) making generalizability at that level high. In the SB, participants only consented to the survey. Thus, it is not surprising that the response rate is lower in HC than SB. Finally, our language acculturation scale was validated in a Hispanic sample, and not among white or black immigrants. Validation of acculturation measures in these populations is called for.

Several strengths of our study also merit discussion. No previous analysis has looked at the relation between acculturation and activity in a multiethnic population. This is important as

interventions are often conducted in multiethnic populations. Furthermore, no study we are aware of has examined the relation between language acculturation or generation and any intensity OPA. We chose to exclude extreme physical activity values because of concerns that these may not reflect true activity levels and because we were concerned that extreme values on a skewed distribution could unduly influence the results. Models including these values yielded similar results.

Conclusions

Regardless of sampling frame or measure employed, we found that language acculturation and generation were important correlates of both OPA and LTPA in low-income multiethnic individuals (albeit in different directions). Furthermore, while individuals of low acculturation were less likely than more acculturated individuals to be physically active in leisure time, they were more likely to be active at work. Physical activity recommendations need to acknowledge that some population groups continue to have substantial OPA. Reliable and valid OPA measures are necessary to determine which individuals may meet physical activity recommendations through non-leisure activity so that LTPA messages may be tailored to the appropriate audience.

We found that individuals who were less acculturated or who were foreign born generally had lower levels of LTPA and higher levels of OPA than those who were most acculturated or who were second plus generation. Public health efforts to increase physical activity levels should consider acculturation level when developing policies or interventions.

Acknowledgements

We would like to thank the staff and investigators of the Harvard Cancer Prevention Program Project. We would like to thank Robert Glynn for statistical advice, I-Min Lee for methodological advice and input and Dolores Acevedo-Garcia for assistance in conceptualizing acculturation. The data collection in the manuscript was supported by a grant from the National Cancer Institute (Grant PO1 CA 75308). Kathleen Y. Wolin was supported by National Cancer Institute training grants 5 T32 CA09001-28 and R25 CA 100600-01A1.

References

- Ainsworth BE, Haskell WL, Leon AS, Jacobs DR Jr, Montoye HJ, Sallis JF, et al. Compendium of physical activities: classification of energy costs of human physical activities. *Med Sci Sports Exercise* 1993;25:71–80.
- Airhihenbuwa CO, Kumanyika S, Agurs TD, Lowe A. Perceptions and beliefs about exercise, rest, and health among African–Americans. *Am J Health Promot* 1995;9:426–429. [PubMed: 10150533]
- Anonymous. Prevalence of leisure-time and occupational physical activity among employed adults—United States, 1990. *Morb Mort Wkly Rep* 2000;49:420–424.
- Anonymous. Physical activity trends—United States, 1990–1998. *Morb Mort Wkly Rep* 2001;50:166–169.
- Anonymous. Prevalence of physical activity, including lifestyle activities among adults—United States, 2000–2001. *Morb Mort Wkly Rep* 2003;52:764–769.
- Arcia E, Skinner M, Bailey D, Correa V. Models of acculturation and health behaviors among Latino immigrants to the US. *Soc Sci Med* 2001;53:41–53. [PubMed: 11386307]
- Barry DT. Development of a new scale for measuring acculturation: The East Asian Acculturation Measure (EAAM). *J Immig Health* 2001;3:193–197.
- Cantero PJ, Richardson JL, Baezconde-Garbanati L, Marks G. The association between acculturation and health practices among middle-aged and elderly Latinas. *Ethn Dis* 1999;9:166–180. [PubMed: 10421079]
- Chasan-Taber S, Rimm EB, Stampfer MJ, Spiegelman D, Colditz GA, Giovannucci E, et al. Reproducibility and validity of a self-administered physical activity questionnaire for male health professionals. *Epidemiology* 1996;7:81–86. [PubMed: 8664406]

- Coonrod DV, Balcazar H, Brady J, Garcia S, Van Tine M. Smoking, acculturation and family cohesion in Mexican–American women. *Ethn Dis* 1999;9:434–440. [PubMed: 10600066]
- Crespo CJ, Smit E, Andersen RE, Carter-Pokras O, Ainsworth BE. Race/ethnicity, social class and their relation to physical inactivity during leisure time: results from the Third National Health and Nutrition Examination Survey, 1988–1994. *Am J Prev Med* 2000;18:46–53. [PubMed: 10808982]
- Crespo CJ, Smit E, Carter-Pokras O, Andersen R. Acculturation and leisure-time physical inactivity in Mexican American adults: results from NHANES III, 1988–1994. *Am J Public Health* 2001;91:1254–1257. [PubMed: 11499114]
- Cuellar I, Harris LC, Jasso R. An acculturation scale for Mexican American normal and clinical populations. *Hisp J Behav Sci* 1980;2:199–217.
- Emmons KM, Stoddard AM, Gutheil C, Suarez EG, Lobb R. Cancer prevention for working class, multiethnic populations through health centers: the Healthy Directions Study. *Cancer Causes Control* 2003;14:727–737. [PubMed: 14674737]
- Gordon-Larsen P, Harris KM, Ward DS, Popkin BM. Acculturation and overweight-related behaviors among Hispanic immigrants to the US: the National Longitudinal Study of Adolescent Health. *Soc Sci Med* 2003;57:2023–2034. [PubMed: 14512234]
- Hazuda HP, Stern MP, Haffner SM. Acculturation and assimilation among Mexican Americans: scales and population-based data. *Soc Sci Q* 1988;69:687–705.
- Heesch KC, Brown DR, Blanton CJ. Perceived barriers to exercise and stage of exercise adoption in older women of different racial/ethnic groups. *Women Health* 2000;30:61–76. [PubMed: 10983610]
- Huang B, Rodriguez BL, Burchfiel CM, Chyou PH, Curb JD, Yano K. Acculturation and prevalence of diabetes among Japanese–American men in Hawaii. *Am J Epidemiol* 1996;144:674–681. [PubMed: 8823064]
- Hunt MK, Stoddard A, Barbeau EM, Wallace L, Sorensen G. Cancer prevention for working class, multiethnic populations through small businesses: The Healthy Directions Study. *Cancer Causes Control* 2003;14:749–760. [PubMed: 14674739]
- Khan LK, Sobal J, Martorell R. Acculturation, socioeconomic status, and obesity in Mexican Americans, Cuban Americans, and Puerto Ricans. *Int J Obes Relat Metab Disord* 1997;21:91–96. [PubMed: 9043961]
- Lee SK, Sobal J, Frongillo EA Jr. Acculturation and health in Korean Americans. *Soc Sci Med* 2000;51:159–173. [PubMed: 10832565]
- Marin G, Gamba RJ. A new measurement of acculturation for Hispanics: the Bidimensional Acculturation Scale for Hispanics (BAS). *Hisp J Behav Sci* 1996;18:297–316.
- Marin G, Sabogal F, Marin BV, Otero-Sabogal R, Perez-Stable EJ. Development of a short acculturation scale for Hispanics. *Hisp J Behav Sci* 1987;9:183–205.
- Myers, HF.; Rodriguez, N. Acculturation and physical health in racial and ethnic minorities. In: Chun, KM.; Organista, PB.; Marin, G., editors. *Acculturation: advances in theory, measurement, and applied research*. American Psychological Association; Washington, DC: 2003.
- Norris AE, Ford K, Bova CA. Psychometrics of a brief acculturation scale for Hispanics in a probability sample of urban Hispanic adolescents and young adults. *Hisp J Behav Sci* 1996;18:29–38.
- Perez-Stable EJ, Marin G, Marin BV. Behavioral risk factors: a comparison of Latinos and non-Latino whites in San Francisco. *Am J Public Health* 1994;84:971–976. [PubMed: 8203695]
- Seefeldt V, Malina RM, Clark MA. Factors affecting levels of physical activity in adults. *Sports Med* 2002;32:143–168. [PubMed: 11839079]
- Singh GK, Shiahpush M. Ethnic-immigrant differentials in health behaviors, morbidity, and cause-specific mortality in the United States: an analysis of two national data bases. *Hum Biol* 2002;74:83–109. [PubMed: 11931581]
- Sorensen G, Emmons K, Hunt MK, Barbeau E, Goldman R, Peterson K, et al. Model for incorporating social context in health behavior interventions: applications for cancer prevention for working-class, multiethnic populations. *Prev Med* 2003;37:188–197. [PubMed: 12914824]
- Stern MP, Knapp JA, Hazuda HP, Haffner SM, Patterson JK, Mitchell BD. Genetic and environmental determinants of type II diabetes in Mexican Americans. Is there a “descending limb” to the modernization/diabetes relationship? *Diabetes Care* 1991;14:649–654. [PubMed: 1914814]

- Stoddard, AM.; Krieger, N.; Barbeau, EM.; Bennett, GG.; Fay, ME.; Sorensen, G., et al. Methods and baseline characteristics of two group-randomized trials with multiracial and multiethnic working-class samples. *Prev Chronic Dic.* 2005. [serial online] 2005 Oct [date cited]. Available from: URL: http://www.cdc.gov/pcd/issues/2005/oct/05_0026.htm
- Stodolska M. Ceasing participation in leisure activities after immigration: Eastern Europeans and their leisure behavior. *Soc Leis* 2002;25:79–117.
- Sundquist J, Winkleby M. Country of birth, acculturation status and abdominal obesity in a national sample of Mexican–American women and men. *Int J Epidemiol* 2000;29:470–477. [PubMed: 10869319]
- U.S. Department of Health and Human Services. Physical activity and health: a report of the Surgeon General. US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion; Atlanta, GA: 1996.
- Wallen GR, Feldman RH, Anliker J. Measuring acculturation among Central American women with the use of a brief language scale. *J Immigr Health* 2002;4:95–102. [PubMed: 16228765]
- Whitfield KE, Weidner G, Clark R, Anderson NB. Sociodemographic diversity and behavioral medicine. *J Consult Clin Psychol* 2002;70:463–481. [PubMed: 12090363]
- Wolf AM, Hunter DJ, Colditz GA, Manson JE, Stampfer MJ, Corsano KA, et al. Reproducibility and validity of a self-administered physical activity questionnaire. *Int J Epidemiol* 1994;23:991–999. [PubMed: 7860180]

Table 1Harvard Cancer Prevention Program Project participant demographics by study group^{a,b}

	Health centers(<i>n</i> = 2205)		Small business(<i>n</i> = 1725)	
	<i>n</i>	%	<i>n</i>	%
<i>Race</i>				
White	1290	59.2	1174	68.5
Black	579	26.6	92	5.4
Hispanic	153	7.0	202	11.8
Other race/ethnicity	158	7.3	245	14.3
<i>Income</i>				
<\$10,000	94	4.3	16	1.0
\$10,000–20,000	150	6.8	83	4.8
\$20,000–30,000	212	9.6	209	12.1
\$30,000–40,000	239	10.8	236	13.7
\$40,000–\$50,000	418	19.0	275	15.9
>\$50,000	1092	49.5	906	52.5
<i>Gender</i>				
Male	744	33.8	1156	67.1
Female	1458	66.2	566	32.9
<i>Occupation</i>				
Professional, technical, managerial	985	44.7	387	22.4
Clerical, sales, service	852	38.6	298	17.3
Other (includes processing, machine trade, benchwork)	125	5.7	951	55.1
No occupation	243	11.0		
<i>Generational status</i>				
Second plus generation	1327	60.4	965	56.2
First generation	395	18.0	175	10.2
Foreign born	475	21.6	578	33.6
<i>Language acculturation</i>				
Low	93	4.4	297	19.7
Moderate	205	9.6	227	15.1
High	1828	86.0	982	65.2
	Mean	SD	Mean	SD
Age (years)	50.1	13.1	43.6	11.7
OPA (MET hours/week)	14.2	34.2	38.4	63.6
LTPA (MET hours/week)	22.7	22.3	28.9	27.5

^aNumber of subjects may vary due to missing data for some items.^bNumber of subjects in analyses vary due to exclusion of outliers.

Table 2

MET hours/week of LTPA by language acculturation and generation, Harvard Cancer Prevention Program Project

	Age adjusted	Model 2	Model 3
	MET hours/week (95% CI)	MET hours/week ^a (95% CI)	MET hours/week ^b (95% CI)
<i>Health centers</i>			
Language acculturation	<i>n</i> = 1917	<i>n</i> = 1897	<i>n</i> = 1897
High acculturation	0	0	0
Moderate acculturation	-1.41 (-4.00, 1.18)	-1.58 (-4.44, 1.28)	-1.38 (-4.24, 1.48)
Low acculturation	-4.44 (-8.26, -0.62)	-4.87 (-9.44, -0.30)	-4.24 (-8.83, 0.35)
Generation	<i>n</i> = 1979	<i>n</i> = 1957	<i>n</i> = 1957
Second plus	0	0	0
First	1.55 (-0.49, 3.59)	0.89 (-1.15, 2.93)	0.99 (-1.05, 3.03)
Foreign born	-2.54 (-4.44, -0.64)	-1.64 (-3.76, 0.48)	-1.43 (-3.57, 0.71)
<i>Small business</i>			
Language acculturation	<i>n</i> = 1320	<i>n</i> = 1311	<i>n</i> = 1311
High acculturation	0	0	0
Moderate acculturation	2.44 (-0.54, 5.42)	1.86 (-1.39, 5.11)	2.30 (-0.97, 5.57)
Low acculturation	-4.41 (-7.71, -1.71)	-3.53 (-6.67, -0.30)	-2.54 (-5.85, 0.77)
Generation	<i>n</i> = 1484	<i>n</i> = 1473	<i>n</i> = 1473
Second plus	0	0	0
First	0.26 (-3.01, 3.53)	0.64 (-2.65, 3.93)	1.09 (-2.18, 4.36)
Foreign born	-3.71 (-5.89, -1.53)	-3.22 (-5.85, -0.59)	-2.66 (-5.31, -0.01)

^aModel 2—adjusted for age, gender and race.

^bModel 3—adjusted for age, gender, race, income and occupation.

Table 3
MET hours/week of OPA by language acculturation and generation, Harvard Cancer Prevention Program Project

	Age adjusted	Model 2	Model 3
	MET hours/week (95% CI)	MET hours/week ^a (95% CI)	MET hours/week ^b (95% CI)
<i>Health centers</i>			
Language acculturation	<i>n</i> = 1449	<i>n</i> = 1432	<i>n</i> = 1432
High acculturation	0	0	0
Moderate acculturation	0.41 (−4.31, 5.13)	0.86 (−4.49, 6.21)	0.02 (−5.35, 5.39)
Low acculturation	10.88 (3.88, 17.88)	11.70 (3.27, 20.13)	9.73 (1.26, 18.20)
Generation	<i>n</i> = 1509	<i>n</i> = 1490	<i>n</i> = 1490
Second plus	0	0	0
First	−0.30 (−4.32, 3.72)	−0.43 (−4.51, 3.65)	−0.71 (−4.79, 3.37)
Foreign born	2.76 (−0.69, 6.21)	2.29 (−1.67, 6.25)	1.23 (−2.73, 5.19)
<i>Small business^c</i>			
Language acculturation	<i>n</i> = 1330	<i>n</i> = 1322	<i>n</i> = 1322
All participants			
High acculturation	0		
Moderate acculturation	17.20 (9.81, 24.59)		
Low acculturation	12.36 (5.25, 19.47)		
Men			
High acculturation		0	0
Moderate acculturation		7.72 (−1.24, 16.68)	5.10 (−3.78, 13.98)
Low acculturation		17.52 (6.99, 28.05)	13.15 (2.66, 23.64)
Women			
High acculturation		0	0
Moderate acculturation		−12.51 (−26.05, 1.03)	−14.84 (−28.27, −1.41)
Low acculturation		−23.71 (−33.61, −13.81)	−28.46 (−38.42, −18.50)
Generation	<i>n</i> = 1513	<i>n</i> = 1503	<i>n</i> = 1503
Second plus	0	0	0
First	8.05 (−0.04, 16.14)	6.09 (−1.79, 13.97)	5.02 (−2.78, 12.82)
Foreign born	12.70 (7.21, 18.19)	5.28 (−1.07, 11.63)	2.98 (−3.31, 9.27)

^a Model 2—adjusted for age, gender and race.

^b Model 3—adjusted for age, gender, race and income.

^c Gender-specific estimates of SB models of language acculturation are based on a model including language acculturation, age, gender, race and the interaction of gender and language acculturation in Model 2. Model 3 also includes income.