

UCLA

UCLA Previously Published Works

Title

The relationship between expectations for aging and physical activity among older adults

Permalink

<https://escholarship.org/uc/item/0314c5t7>

Journal

Journal of General Internal Medicine, 20(10)

ISSN

0884-8734

Authors

Sarkisian, CA
Prohaska, TR
Wong, MD
[et al.](#)

Publication Date

2005-10-01

DOI

10.1111/j.1525-1497.2005.0204.x

Peer reviewed

The Relationship Between Expectations for Aging and Physical Activity Among Older Adults

Catherine A. Sarkisian, MD, MSPH,¹ Thomas R. Prohaska, PhD,² Mitchell D. Wong, MD, PhD,³ Susan Hirsch, MPH,¹ Carol M. Mangione, MD, MSPH³

¹Department of Medicine, Division of Geriatrics, David Geffen School of Medicine at UCLA, Los Angeles, Calif, USA; ²Department of Community Health Sciences, School of Public Health, University of Illinois at Chicago, Ill, USA; ³Department of Medicine, Division of General Internal Medicine and Health Services Research, David Geffen School of Medicine at UCLA, Los Angeles, Calif, USA.

BACKGROUND: New strategies to increase physical activity among sedentary older adults are urgently needed.

OBJECTIVE: To examine whether low expectations regarding aging (age-expectations) are associated with low physical activity levels among older adults.

DESIGN: Cross-sectional survey.

PARTICIPANTS: Six hundred and thirty-six English- and Spanish-speaking adults aged 65 years and above attending 14 community-based senior centers in the Los Angeles region. Over 44% were non-Latino whites, 15% were African American, and 36% were Latino. The mean age was 77 years (range 65 to 100).

MEASUREMENTS: Self-administered written surveys including previously tested measures of age-expectations and physical activity level in the previous week.

RESULTS: Over 38% of participants reported <30 minutes of moderate-vigorous physical activity in the previous week. Older adults with lower age-expectations were more likely to report this very low level of physical activity than those with high age-expectations, even after controlling for the independent effect of age, sex, ethnicity, level of education, physical and mental health-related quality of life, comorbidity, activities of daily living impairment, depressive symptoms, self-efficacy, survey language, and clustering at the senior center. Compared with the quintile of participants having the highest age-expectations, participants with the lowest quintile of age-expectations had an adjusted odds ratio of 2.6 (95% confidence intervals: 1.5, 4.5) of reporting <30 minutes of moderate-vigorous physical activity in the previous week.

CONCLUSIONS: In this diverse sample of older adults recruited from senior centers, low age-expectations are independently associated with very low levels of physical activity. Harboring low age-expectations may act as a barrier to physical activity among sedentary older adults.

KEY WORDS: attitude to health; aged; exercise; survey; health behavior.
DOI: 10.1111/j.1525-1497.2005.0204.x
J GEN INTERN MED 2005; 20:911-915.

Regular physical activity offers one of the greatest opportunities to extend years of active independent life for older persons.¹ Despite extensive evidence about the benefits of exercise, however, less than 40% of adults aged 65 years and older exercise routinely.² Even more discouraging, there has been little success over the past 2 decades in motivating older Americans to adopt and sustain physically active lifestyles.¹ The care that General Internists provide to older adults would

be greatly improved by the identification of new strategies to increase physical activity among older adults.

Among older adults, attributing health problems to "old age" rather than illness is a common phenomenon³⁻⁵ familiar to Internists who care for older adults. Although attributing health problems to old age and having negative perceptions of aging are associated with increased mortality,^{6,7} causal mechanisms driving this association remain to be elucidated. One possibility is that beliefs about aging affect health outcomes by influencing health behaviors. For example, older adults report being less likely to seek health care when they attribute symptoms to aging⁸ and when they have low expectations for aging.⁹ Goodwin et al.¹⁰ found that seniors with fatalistic views about aging are less likely to have a primary care provider or receive vaccinations. This body of work as well as our own clinical experiences caring for older adults led us to hypothesize that among older adults, low age-expectations act as a barrier to participation in physical activity.

To begin to address this question, we administered surveys to a diverse sample of older adults recruited in senior centers in the greater Los Angeles region. Our specific aim was to determine whether among older adults, having low expectations regarding aging (age-expectations) is associated with low physical activity levels.

METHODS

Subjects

Between September and November 2001, we invited English- and Spanish-speaking adults at 14 senior centers to complete self-administered questionnaires. These community-based senior centers, funded through the City of Los Angeles Department of Aging and the Los Angeles County Area Agency on Aging, provide a diverse range of activities and support services to older adults, including free or low-cost hot lunches. Approximately half offered some sort of senior center-based physical activity class at the time data were collected. Most work with community agencies to provide transportation to older adults with functional limitations. Eligible subjects were those age 65 years or above, and able to read English or Spanish. After making brief presentations about the project, bilingual project staff distributed questionnaires with \$5 incentives. To calculate retest reliability, we mailed the questionnaire to a random 20% of participants 2 weeks later.

A part of this manuscript was presented at the national meeting of the Society of General Internal Medicine in Vancouver, Canada, in May 2003.

Address correspondence and requests for reprints to Dr. Sarkisian: Department of Medicine, Division of Geriatrics, David Geffen School of Medicine at UCLA, 10945 Le Conte Avenue, Suite 2339, Los Angeles, CA 90095-1687 (e-mail: csarkisian@mednet.ucla.edu).

Received for publication January 12, 2005

and in revised form April 27, 2005

Accepted for publication May 25, 2005

Measures

The primary independent variable was the total score on the ERA-38 Survey, in which higher scores indicate expecting higher health-related quality of life (HRQoL) with aging, and lower scores indicate expecting decline¹¹ (appendix, available online). This instrument has demonstrated acceptable reliability and validity in a previous field test among community-residing older adults as a measure of expectations regarding aging (age-expectations).¹¹ The primary dependent variable was the score on the modified Lorig Self-management Behavior Exercise Survey,¹² which measures how many minutes (categorized into 5 mutually exclusive groups) in the previous week respondents participated in "walking for exercise, swimming, bicycling (including stationary bike), or other aerobic exercise." This instrument has demonstrated acceptable reliability and validity in assessing physical activity in groups of older adults.¹² We also measured characteristics which, based on the published literature about physical activity among older adults,¹³ were likely to be associated with physical activity, and could confound the relationship between age-expectations and physical activity. We measured HRQoL using the Medical Outcomes Study Short-Form-12, and computed Physical Component Summary (PCS-12) and Mental Component Summary (MCS-12) scores using standardized weights based upon a mean of 50 and a standard deviation of 10 in the general U.S. population, with higher scores indicating better health status.¹⁴ We measured medical comorbidity using the Charlson comorbidity scale modified for self-administration by Katz et al.¹⁵ and Katz and Lawton basic and instrumental activities of daily living (ADLs).^{16,17} We measured depressive symptoms using the 5-item Geriatric Depression Scale,¹⁸ and general self-efficacy using 3 items from the Pearlin mastery scale.¹⁹ All instruments were forward and backward-translated into Mexican/Central-American Spanish using professional translators, and pilot tested for comprehension with a convenience sample of older Latinos ($n=10$). The UCLA Office for the Protection of Human Subjects approved the study.

Analyses

Based on the distribution of scores on the Lorig Self-management Exercise Survey, which showed a very low level of physical activity in general, we dichotomized scores into those reporting less than 30 minutes total time in physical activity in the previous week versus those reporting 30 minutes or greater. We tested the bivariate association between physical activity level and age-expectations using χ^2 tests. Next, we constructed a series of logistic regression models with the ERA-38 score as the independent variable, and physical activity (less than 30 minutes a week vs 30 minutes or greater) as the dependent variable. To adjust for characteristics that might influence the relationship between age-expectations and physical activity, we included the following covariates: age, sex, ethnicity, level of education, PCS-12 score, MCS-12 score, comorbidity, depressive symptoms, ADL impairment, self-efficacy, and language of survey (Spanish vs English). We selected these variables based on previous studies examining physical activity among older adults,¹³ as well as our own work examining expectations for aging^{9,11}; all variables were selected a priori, and all selected variables were included in the final

models, regardless of whether they showed a statistically significant relationship with the dependent variable. We adjusted for clustering at the level of the senior center using the Huber-White method.²⁰ Because the risk of measurement error increases when data are pooled from 2 different languages, in a sensitivity analysis we reconstructed the final model excluding participants who completed the survey in Spanish.

To explore whether the relationship between physical activity and age-expectations changed with different cut points for "low" physical activity, we reconstructed the multivariate models using other cut points: none versus any physical activity in the previous week, and less than 60 minutes versus more than 60 minutes in the previous week.

To explore which aspects of age-expectations are most closely related to low physical activity, we reconstructed logistic models using each of the 10 subscales of the ERA-38 as the primary independent variable (lowest quintile vs highest quintile), adjusting for each of the covariates described above.

RESULTS

Approximately 15% of seniors invited to participate refused. Between 8 and 96 seniors completed surveys at each site (642 total). We excluded 6 participants who did not complete items asking about physical activity, leaving a sample size of 636

Table 1. Descriptive Statistics of Sample ($n=636$)

Characteristic	Value
Mean age \pm SD	77.5 \pm 6.3
Range	(65 to 100)
% Female, (n)	76.4 (486)
Ethnicity*	
% Non-Latino White (n)	43.7 (278)
% African American (n)	15.4 (98)
% Latino (n)	36.0 (229)
% Asian American (n)	1.9 (12)
Level of formal education completed [†]	
% 5th grade or less (n)	5.2 (33)
% 6th to 8th grade (n)	9.4 (60)
% 9th to 12th grade (n)	39.8 (253)
% Some college (n)	24.5 (156)
% College graduate (n)	14.2 (90)
Mean PCS-12 score \pm SD	43.8 \pm 10.6
Mean MCS-12 score \pm SD	52.9 \pm 9.3
Activities of daily living	
% With difficulty (or inability) bathing (n)	10.8 (69)
% With difficulty (or inability) dressing (n)	8.5 (54)
% Scoring \leq 2 on 5-item Geriatric Depression Scale (n)	19.7 (125)
Self-reported comorbidities	
Diabetes	17.8 (113)
Hypertension	51.5 (328)
Heart attack	9.2 (58)
Stroke	8.2 (52)
Urinary incontinence	31.6 (201)
Pain limiting daily activities	23.7 (151)
Memory loss problems	28.9 (184)
Difficulty with vision (even with glasses)	24.5 (156)
Total time spent in physical activity in past week	
None	127 (20)
< 30 min	120 (19)
30 to 60 min	164 (26)
1 to 3 h	101 (16)
> 3 h	124 (20)

*Item was missing for 15 participants (2.4% of sample).

[†]Item was missing for 44 participants (6.9% of sample).

PCS, Physical Component Summary; MCS, Mental Component Summary.

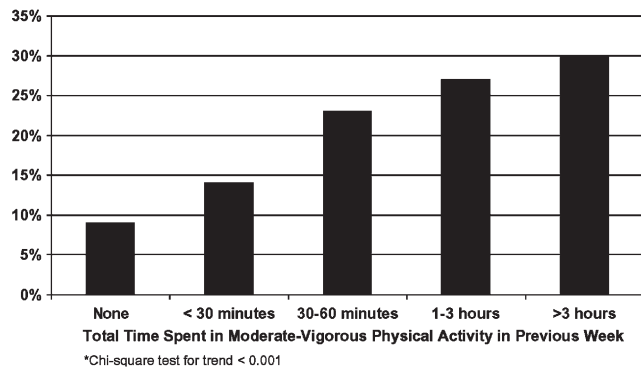


FIGURE 1. Percentage of participants with expectations for aging in highest quintile (χ^2 test for trend was P less than 0.001). The height of the bars (the y-axis) represents the percentage of participants who scored in the highest quintile on the Expectations Regarding Aging (ERA-38) Survey, for each of 5 possible response bins representing the total time spent in moderate-vigorous physical activity in the previous week (the x-axis). High ERA-38 scores indicate expecting high physical and mental functioning with aging. As shown, the least physically active seniors are the least likely to have high expectations regarding aging: only 8% of seniors with no physical activity in the previous week had high expectations for aging, while 30% of seniors with greater than 3 hours of physical activity had high expectations for aging.

participants, 56 of whom completed the questionnaire in Spanish. Table 1 presents the characteristics of the sample. Participants' mean age was 78 years. Over 76% of participants were female; 44% were nonLatino whites, 15% were African American, and 36% were Latino. Twenty percent of participants reported no physical activity in the past week, and another 19% reported less than 30 minutes. Of the random 20% of participants who were mailed a follow-up questionnaire 2 weeks after completing the original, 118 (90%) returned a

completed survey. The intraclass correlation coefficients (re-test reliability) were 0.99 for the Lorig Self-management Behavior Exercise Survey and 0.96 for the total ERA-38 score.

Figure 1 illustrates the unadjusted relationship between physical activity and high age-expectations: the greater the amount of exercise reported in the previous week, the greater the percentage of participants scoring in the highest quintile on the ERA-38. The χ^2 test for trend was $P < .001$. The relationship between physical activity and other quintiles of age-expectations was not linear.

In a multivariate regression model controlling for the independent effect of age, sex, ethnicity, level of education, physical and mental HRQoL, comorbidity, ADL impairment, depressive symptoms, self-efficacy, survey language, and clustering at the senior center, older adults with lower age-expectations were more likely to report low levels of physical activity than those in the highest quintile of age-expectations (Table 2). Compared with the quintile of participants having the highest age-expectations, the quintile of participants with the lowest age-expectations had an adjusted odds ratio of 2.6 (95% confidence intervals [CIs]: 1.5, 4.5) of reporting <30 minutes of moderate-vigorous physical activity in the previous week. Participants in each of the 4 lowest quintiles of age-expectations were more likely to have low physical activity than those in the highest quintile, with adjusted odds ratios ranging from 1.8 to 2.8. Older age, being female, having low PCS-12 scores, and being African American were also independently associated with low physical activity ($P < .05$ for all). None of the other covariates were independently associated with low physical activity level. In a sensitivity analysis, we reran the model excluding the 56 participants who completed the survey in Spanish, and the results did not change.

In multivariate models exploring whether the association between age-expectations and physical activity persists using different cut points for "low" physical activity, we found that

Table 2. Correlates of Reporting <30 min of Physical Activity in the Previous Week

Characteristic	Mean ERA-38 score (Standard Deviation)	Unadjusted Odds Ratio (95% Confidence Interval)	Adjusted Odds Ratio (95% Confidence Interval)*
ERA			
Quintile 1 (highest ERA)	64.1 (10.2)	1.0 (ref)	1.0 (ref)
Quintile 2	46.8 (2.8)	3.0 (1.7 to 5.2)	2.8 (1.4 to 5.7)
Quintile 3	38.4 (2.3)	2.3 (1.3 to 3.9)	2.1 (1.4 to 3.3)
Quintile 4	30.2 (2.5)	2.2 (1.3 to 3.8)	1.8 (0.9 to 3.6)
Quintile 5 (lowest ERA)	18.2 (6.0)	3.4 (2.0 to 5.9)	2.6 (1.5 to 4.5)
Increased age (per 5y interval)	NA	1.2 (1.1 to 1.4)	1.2 (1.0 to 1.3)
Female sex	NA	1.6 (1.1 to 2.4)	1.5 (1.0 to 2.4)
Physical health-related quality of life [†]	NA	3.2 (1.9 to 5.4)	2.3 (1.6 to 3.3)
Mental health-related quality of life [†]	NA	1.1 (0.7 to 1.8)	0.9 (0.5 to 1.7)
Number of comorbidities	NA	1.0 (1.0 to 1.1)	1.0 (0.8 to 1.1)
Self-efficacy [‡]	NA	0.6 (0.5 to 0.8)	0.8 (0.6 to 1.1)
Depressed mood	NA	1.4 (0.9 to 2.2)	1.5 (0.9 to 2.5)
Inability with ≥ 1 ADL	NA	1.7 (1.1 to 2.5)	1.4 (0.8 to 2.3)
Ethnicity (reference =white)			
African American	NA	1.3 (0.8 to 2.1)	1.8 (1.1 to 2.9)
Latino	NA	1.0 (0.7 to 1.4)	1.1 (0.8 to 1.6)
Level of education	NA	0.9 (0.8 to 1.0)	0.9 (0.8 to 1.1)
Spanish language survey	NA	0.9 (0.5 to 1.6)	0.7 (0.5 to 1.2)

*Model adjusted for clustering at the level of the senior center.

[†]Lowest quintile compared with highest.

[‡]Scores range from 1 to 4, with higher scores indicating greater self-efficacy.

ERA, expectations regarding aging; ADL, activities of daily living; NA, not applicable.

Table 3. Adjusted Associations Between ERA-38 Subscales with < 30 min of Physical Activity in the Previous Week*

ERA-38 Subscale	Adjusted Odds Ratio (95% Confidence Interval) [†]
General health	2.9 (1.6 to 5.4)
Cognitive function	2.0 (0.9 to 4.6)
Mental health	1.7 (1.0 to 3.0)
Functional independence	1.9 (1.2 to 3.1)
Sexual function	1.1 (0.7 to 1.8)
Pain	1.8 (1.1 to 2.9)
Urinary incontinence	0.9 (0.3 to 2.8)
Sleep	1.7 (0.8 to 3.2)
Fatigue	2.5 (1.3 to 4.9)
Appearance	2.1 (1.3 to 3.5)

*Each row shows the result of a unique model in which those scoring in the lowest quintile of scores for 1 ERA-38 subscale was compared with those scoring in the highest quintile.

[†]Each model was adjusted for age, sex, ethnicity, level of education, physical-and mental health-related quality of life, depressive symptoms, general self-efficacy, ADL impairment, comorbidity, depressive symptoms, language of survey, and clustering at the level of the senior center.

ERA, expectations regarding aging; ADL, activities of daily living.

with a cut point of no physical activity (vs any) in the previous week, the adjusted odds ratio (95% CIs) for those with the lowest quintile of ERA-38 scores was 2.9 (1.2, 7.3) for reporting “low” physical activity in the previous week. With a cut point of less than 60 minutes (vs 60 minutes or greater), the adjusted odds ratio was 1.6 (1.1, 2.3).

Table 3 illustrates the relationship between low age-expectations and low physical activity for each of the 10 subscales of the ERA-38. The subscales for which low scores were independently associated with low physical activity were: expectations for general health, expectations for functional independence, expectations for pain, expectations for fatigue, and expectations for appearance (odds ratios ranging from 1.8 to 2.5, $P < .05$ for all). The relationship between low expectations for mental health and low physical activity was of borderline statistical significance (odds ratio [OR] 1.7, 95% CI 1.0, 3.0).

DISCUSSION

Among a diverse sample of older adults who attend senior centers, those with low expectations regarding aging were more likely to report very low levels of physical activity than those with high age-expectations, even after adjusting for sociodemographic characteristics, self-efficacy, and many indicators of health status. While it is impossible to determine causality in this cross-sectional investigation, this finding supports our hypothesis that harboring low age-expectations may act as a barrier to physical activity among sedentary older adults.

It has been well demonstrated that people's beliefs about aging are strongly associated with health outcomes,^{6,7} but how these beliefs lead to outcomes is unknown, and an area of active investigation because of the theoretical potential to improve health outcomes by changing beliefs about aging. Previous work has demonstrated that beliefs about aging are associated with seeking health care and receiving vaccinations⁸⁻¹⁰; our study extends these earlier findings by identifying physical activity as another important health behavior that

is negatively associated with beliefs about aging. Clinical care of older adults would be greatly improved by identification of interventions to raise physical activity levels among sedentary seniors; future research could pursue our finding by examining whether intervening to raise age-expectations could succeed in raising and sustaining physical activity levels among older adults.

We did not find a linear relationship between age-expectations and physical activity. Instead, we found that older adults with all levels of age-expectations other than those in the highest quintile had a substantially increased likelihood of low physical activity. These findings suggest that there may exist a threshold of age-expectations below which one's age-expectations serve as a barrier, and above which it may be easier to start a physical activity program.

As described previously, even middle-range scores on the ERA-38 represent qualitatively low expectations for aging.⁹ To illustrate, of those in the second highest quintile of ERA-38 scores, 23% agreed that “becoming depressed is a normal part of aging” (compared with 4% of those in the highest quintile), and 52% agreed that “there is no way to escape the physical deterioration of aging” (compared with 24% of those in the highest quintile). While it may not be possible—or desirable—to raise age-expectations of all older adults to the level held by those in the highest quintile, the data clearly show that older adults with the highest age-expectations are the most likely not to be sedentary.

The subscale analyses offer some insights into which aspects of age-expectations are most important in relation to low physical activity. Interestingly, all 5 scales that are independently associated with low physical activity represent domains that can improve with physical activity: general health, functional independence, pain, fatigue, and appearance. This subscale analysis not only strengthens the validity of our findings but also suggests specific domains of age-expectations to target if designing interventions to test whether changing expectations can lead to increased physical activity among sedentary older adults.

This study has several important limitations. Because the simple measure of physical activity that we selected did not provide continuous data, we were forced to select a cut point for “low” physical activity. Although this sample reported more physical activity than a population-based sample,² the large proportion of participants in this study who reported no physical activity in the previous week (20% of the sample), or less than 30 minutes (another 19%) is remarkable. While the robustness of our findings is supported by the analyses showing that the association between age-expectations and “low” physical activity persists when “low” was defined as “none” or as “less than 60 minutes,” it is important to note that our findings pertain only to the most sedentary older adults; whether the relationship between age-expectations and physical activity is similar among groups of older persons who are closer to meeting currently recommended levels of physical activity (30 minutes on most days) should be examined in other samples with larger numbers of more physically active seniors.

Although our findings support the hypothesis that low age-expectations act as a barrier for older adults' participation in physical activity, caution should be exercised before concluding from this cross-sectional study that age-expectations actually act as a barrier to physical activity. Another explanation for our findings could be that participating in physical activity causes

older adults to raise their age-expectations. Conversely, a sedentary lifestyle could cause older adults to lower their age-expectations. These possibilities, including whether a change in physical activity level is associated with a change in age-expectations, should be examined in longitudinal studies.

Likewise, although we controlled for many health characteristics and general self-efficacy, other unmeasured characteristics may confound the relationship between age-expectations and physical activity, including self-efficacy for physical activity. In attempting to minimize participant response burden, we did not measure all other constructs that have recently been shown to be associated with physical activity, but are unlikely to be associated with age-expectations, such as perceived social support and neighborhood characteristics.²¹ It would be interesting in future studies to determine whether perceived neighborhood characteristics explain the finding (of borderline statistical significance) that women were more likely to be sedentary. It is also important to note that the Lorig Self-management Exercise Survey is not an "objective" measure of physical activity, and does not capture all types of physical activity that older adults may participate in, and that may be beneficial to health in aging, such as flexibility or strength training, and/or Tai Chi. In addition, the sample was recruited from a single geographic region using a convenience method favoring older adults who frequent senior centers, and there were fewer men in this sample than in a national sample of older adults. Our findings may not generalize to other groups, especially those who do not speak English or Spanish.

In conclusion, among this diverse group of older adults recruited from senior centers, having low expectations regarding aging is a strong, independent correlate of very low physical activity. Along with other psychosocial characteristics currently under investigation, age-expectations deserve to be considered as a potentially powerful new way to raise and sustain physical activity levels among sedentary older adults.

This work could not have been completed without the generous cooperation of our partners at 14 community senior centers: Baldwin Park Community Center, Claude Pepper Senior Center, Culver City Senior Center, Cheviot Hills Senior Citizens' Club, City of Commerce Senior Center, Dollarhide Neighborhood Center of Compton, Joslyn Adult Center of Burbank, Mar Vista Senior Citizen Center, Montebello Senior Center, Mt. Carmel Senior Center, Santa Fe Springs Neighborhood Center, South El Monte Senior Center, Theresa Lindsay Senior Center, and Wilmington Senior Citizens Multi-Purpose Center.

Support for Dr. Sarkisian was provided by a Paul B. Beeson Career Development Award from the National Institute of Aging (1K23 AG024811), and the UCLA Mentored Clinical Scientist

Supplementary Material

The following Supplementary material is available for this article online:

Appendix. Expectations regarding Aging Survey (ERA-38) and Sub-scale description.

Program (K12) in Geriatrics, National Institutes of Health, National Institute of Aging (AG01004). Support for Dr. Prohaska was provided by University of Illinois at Chicago Healthy Aging Research Network Center (SIP5-01) Center for Disease Control and Prevention U48/CCU 509661. Support for Dr. Mangione was provided by the UCLA Center for Health Improvement in Minority Elders/Resource Centers for Minority Aging Research, National Institutes of Health, National Institute of Aging (AG-02-004).

REFERENCES

1. **National Blueprint:** Increasing physical activity among adults age 50 and older. *J Aging Phys Act.* 2001;9(suppl):1-96.
2. **Brown DR, Yore MM, Ham SA, Macera CA.** Physical activity among adults \geq yr with and without disabilities. *RBRSS 2001. Med Sci Sports Exerc.* 2005;37:620-9.
3. **Kart C.** Experiencing symptoms: attribution and misattribution of illness among the aged. In: Hug M, ed. *Elderly Patients and their Doctors.* New York, NY: Springer; 1981.
4. **Williamson JD, Fried LP.** Characterization of older adults who attribute functional decrements to "old age." *J Am Geriatr Soc.* 1996;44:1429-34.
5. **Sarkisian CA, Liu H, Ensrud KE, Stone KL, Mangione CM.** Correlates of attributing new disability to old age. Study of Osteoporotic Fractures Research Group. *J Am Geriatr Soc.* 2001;49:134-41.
6. **Rakowski W, Hickey T.** Mortality and the attribution of health problems to aging among older adults. *Am J Public Health.* 1992;82:1139-41.
7. **Levy BR, Slade MD, Kunkel SR, Kasl SV.** Longevity increased by positive self-perceptions of aging. *J Pers Soc Psychol.* 2002;83:261-70.
8. **Prohaska TR, Keller ML, Leventhal EA, Leventhal H.** Impact of symptoms and aging attribution on emotions and coping. *Health Psychol.* 1987; 6:495-514.
9. **Sarkisian CA, Hays RD, Mangione CM.** Do older adults expect to age successfully? The association between expectations regarding aging and beliefs regarding healthcare seeking among older adults. *J Am Geriatr Soc.* 2002;50:1837-43.
10. **Goodwin JS, Black SA, Satish S.** Aging versus disease: the opinions of older black, Hispanic, and non-Hispanic white Americans about the causes and treatment of common medical conditions. *J Am Geriatr Soc.* 1999;47:973-9.
11. **Sarkisian CA, Hays RD, Berry S, Mangione CM.** Development, reliability, and validity of the expectations regarding aging (ERA-38) survey. *Gerontologist.* 2002;42:534-42.
12. **Lorig KR, Stewart AL, Ritter P, Gonzales V, Laurent D, Lynch J.** *Outcome Measures for Health Education and Other Health Care Interventions.* Thousand Oaks, CA: Sage Publications Inc; 1996.
13. **Brawley LR, Rejeski WJ, King AC.** Promoting physical activity for older adults: the challenges for changing behavior. *Am J Prev Med.* 2003;25 (Suppl 2):172-83.
14. **Ware J Jr., Kosinski M, Keller SD.** A 12-item short-form health survey: construction of scales and preliminary tests of reliability and validity. *Med Care.* 1996;34:220-33.
15. **Katz JN, Chang LC, Sangha O, Fossel AH, Bates DW.** Can comorbidity be measured by questionnaire rather than medical record review? *Med Care.* 1996;34:73-84.
16. **Katz S, Ford AB, Moskowitz RW, Jackson BA, Jaffe MW.** Studies of illness in the aged. The index of Adl: a standardized measure of biological and psychosocial function. *JAMA.* 1963;185:914-9.
17. **Lawton MP, Brody EM.** Assessment of older people: self-maintaining and instrumental activities of daily living. *Gerontologist.* 1969;9:179-86.
18. **Hoyl MT, Alessi CA, Harker JO, et al.** Development and testing of a five-item version of the Geriatric Depression Scale. *J Am Geriatr Soc.* 1999; 47:873-8.
19. **Pearlin LI, Lieberman MA, Menaghan EG, Mullan JT.** The stress process. *J Health Soc Behav.* 1981;22:337-56.
20. **Huber PJ.** The behavior of maximum likelihood estimates under non-standard conditions. *Proceedings of the Fifth Berkeley Symposium on Mathematical Statistics and Probability, Berkeley;* 1967:221.
21. **Addy CL, Wilson DK, Kirtland KA, Ainsworth BE, Sharpe P, Kimsey D.** Associations of perceived social and physical environmental supports with physical activity and walking behavior. *Am J Public Health.* 2004; 94:440-3.