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The Impact of Physical Activity Level on SF-36 Role-Physical and Bodily Pain Indices in Midlife Women

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Abstract

Background—This study was done to determine whether physical activity at baseline is independently associated with musculoskeletal pain and fulfilling one's physical role over 3 subsequent years.

Methods—Our research involved a 3-year longitudinal study of over 2400 community-dwelling, midlife women from the Study of Women's Health Across the Nation (SWAN). Measurements included baseline physical activity using the Kaiser Permanente Health Plan Activity Survey and SF-36 role-physical and bodily pain indices at each of 3 annual follow-up visits.

Results—Each 1-point increase on the physical activity score was associated with a 7% greater likelihood of a high role-physical score (95% CI = 1.02–1.13) and a 10% greater likelihood of a low bodily pain score (95% CI = 1.04–1.17) after adjusting for age, race, menopausal status, educational level, body mass index, depressive symptoms, smoking, and chronic medical conditions. The association between physical activity level and role-physical score was eliminated in the fully adjusted model after adjustment for pain level in post hoc analysis [OR = 1.04 (95% CI = 0.98–1.09)].

Conclusion—This study demonstrates that women who are more physically active at midlife experience less bodily pain over time regardless of menopausal status, sociodemographics, and medical conditions. Higher physical activity level positively impacts fulfilling one's physical role; however, this is mediated by pain level.

Keywords

exercise; females; menopause; disability

According to the United States Census Bureau's most recent estimates in 1997, 52.6 million people (19.7% of the population) had some form of disability, with 33 million people (12.3% of the population) severely disabled.¹ Disability rates increase with age and are higher among women, minorities, and those of lower socioeconomic status. Disability

prevalence in the middle ages was substantial, with 22.6% of individuals between the ages of 45 and 54 with disability, 13.9% with severe disability, and 3.6% requiring personal assistance.

Painful conditions may lead to disability. Models of disablement from Nagi and other researchers include the role of pain leading to functional limitations in performance, thereby linking pathology to disability.²⁻⁴ The World Health Organization (WHO) models of disability, the disease handicap model (DHM), delineates a pathway of disablement from pathology to impairment (loss of physical attribute, ie, reduced joint range of motion) to disability (loss of physical ability, ie, inability to ambulate) to handicap (loss of fulfilling role in society, ie, not able to work outside the home).⁵ The DHM model was updated and revised to include these stages: active pathology, impairment, functional limitations, and disability.² Further work resulted in the disablement process model (DPM), which includes the same 4 domains and additional risk factors and intraindividual and extraindividual factors that may hasten or slow the process.⁴

With this theoretical framework, we reviewed the literature on pain and disability in midlife women and found cross-sectional research linking pain and disability. In a cross-sectional study of postmenopausal white women, participants with back and leg pain had lower scores on the Medical Outcomes Short-Form 36 (SF-36) role-physical, physical-function, and bodily pain indices compared with participants without pain.⁶ Knee pain compromised stair climbing in cross-sectional analyses of white and black women in midlife.⁷ Low back pain is the leading cause of occupational disability in persons younger than 45 years of age and the third leading cause of occupational disability in persons 45 years of age and older.⁸ Self-reported pain was higher in postmenopausal compared with premenopausal women after adjusting for socioeconomic and medical covariates in cross-sectional analyses at follow-up year 3 of the Study of Women Across the Nation (SWAN) cohort.⁹ Other analyses from SWAN found significant ethnic differences on the SF-36 after adjustments for socioeconomic status, health, lifestyles, and social circumstances, with Hispanic women more likely to report bodily pain than Caucasian women.¹⁰

It is important to identify factors at midlife that might reduce the odds of disability. Disability prevalence is high in midlife and increases with age, culminating in 73.6% of individuals 80 years of age and older with disability.¹ Preservation of function at midlife might reduce incident disability in older ages. Among a myriad of risk factors, low physical activity level has been associated with reduced physical functioning in midlife and geriatric populations.^{11,12} A cross-sectional study of midlife women found that somatic complaints, including pain, are negatively associated with exercise.¹³ Greater physical activity was the strongest predictor of increased grip and pinch strength in the SWAN study of the association of menopause and pinch and grip strength.¹⁴

Although there is substantial cross-sectional research demonstrating decline in physical functioning and increase in pain in middle-age women, studies have not specifically addressed the longitudinal association between (1) physical activity level and problems with fulfilling one's physical role or (2) physical activity level and pain level in midlife women during the menopausal transition. The current study was undertaken to address longitudinally if a higher level of physical activity was associated with fewer limitations in fulfilling physical roles and lower bodily pain score on the SF-36 over 3 years in a multiethnic, community-based population of women in their middle years. A greater understanding in this area might lead to reduction in the disablement process, thereby impacting quality of life for women in midlife and beyond and reducing the financial impact of disability on women, their families, and society.

Methods

Participants

Participants were from the Study of Women Across the Nation (SWAN). SWAN, a cohort study of community-based midlife women, enrolled subjects in 7 sites in the United States. The baseline examination, conducted between 1995 and 1997, recruited over 3000 women from 5 ethnic/racial groups including Caucasian, African American, Japanese, Chinese, and Hispanic. Each site had 50% Caucasian and 50% non-Caucasian enrollment, with 1 non-Caucasian ethnic/racial group per site. Women 42 to 52 years of age with an intact uterus and at least 1 ovary were invited to participate in SWAN as long as they had menstruated in the previous 3 months, were not currently pregnant or breast feeding, and had not used reproductive hormone preparations affecting ovarian or pituitary function in the past 3 months. Several population sampling techniques were used, and IRB approval was obtained by the 7 sites, as previously described.¹⁵ At study entry and annually thereafter, women at all sites completed a standard assessment that included self-administered and interviewer-administered questionnaires assessing social, economic, behavioral, psychological, health, and lifestyle characteristics. Interviews and questionnaires were available in English, Spanish, Cantonese, and Japanese. All women provided written informed consent. Subject retention at the end of the third follow-up visit was 82%. Women who completed the study weighed less and were slightly older.

Study Variables

Data for the current study were obtained from questionnaires administered at baseline and annually for 3 years. Data on physical activity level and covariates including site, ethnicity, and education were collected at baseline. Role-physical and pain scores, along with covariates age, menopausal status, body mass index (BMI), depressive symptoms, smoking, and chronic conditions (diabetes, hypertension, myocardial infarction, osteoarthritis, cancer, and osteoporosis) were collected for each of the following 3 years.

Independent Variable

Physical activity level was measured at baseline using a version of the Kaiser Physical Activity Survey (KPAS), which was adapted from the Baecke questionnaire.¹⁶ Refer to Appendix 1 of the Ainsworth et al validation paper for details of the items in the KPAS.¹⁷ The version of KPAS used in SWAN consisted of 38 questions about physical activity in various domains. For this analysis, the results in 2 domains were included, including sports/exercise (4 questions about most frequent sport, frequency, duration, and intensity) and active living (2 questions including walking or biking for transportation and hours of television viewing, which is reverse scored). See the Appendix. Item responses are primarily Likert-scale, with domain-specific activity indices ranging from 1 (*never or rarely does activity*) to 5 (*does activity frequently*), with 5 indicating the highest level of activity in that domain.¹⁸ We used the normally distributed combined score from the sports/exercise and active-living index for our independent variable as a continuous variable with a possible range of 2 to 10. A score of 10 would represent the highest level of activity.

Dependent Variables

The dependent variables included annual scores of the bodily pain and role-physical indices of the Medical Outcomes Study Short Form 36 (SF-36).¹⁹ The SF-36 is a well-validated scale that measures health-related quality of life in 7 domains; however, all domains were not measured annually in SWAN. Each SF-36 domain takes on values from 0 (*poor*) to 100 (*good*). We chose to study the bodily pain and role-physical indices because they were the only pain- or physical function-related indices included annually in SWAN beyond the

baseline assessment, thus allowing for longitudinal analyses. There were 2 bodily pain items (pain magnitude and interference) and 4 role-physical items (limit in time of tasks, accomplished less, limit types of tasks, had difficulty with task). All items are positively scored with higher item values indicating a higher role-physical score. All items are positively scored on the bodily pain index after recoding, with higher item values indicating less pain. Because of the highly skewed distribution of scores, we created binary outcomes using a cut point on the scores in each domain. We followed previous recommendations for the cut point to classify an individual as having impaired health if they score lower than the 25th percentile.²⁰ Women scoring at or below the 25th percentile of the role-physical and bodily pain subscales were classified as having a low role-physical or high bodily pain score, respectively. Women scoring above the 25th percentile were classified as having a high role-physical or low bodily pain score, respectively.

Covariates

Covariate data included sociodemographic variables, menopausal status, medical conditions, BMI, and depression symptom scale. Age was measured in years. Site reflected the location for the respondents including Boston, Massachusetts; Chicago, Illinois; Detroit, Michigan; Los Angeles, California; Newark, New Jersey; Oakland, California; and Pittsburgh, Pennsylvania (referent category). Race/ethnicity included self-identification as African American, Chinese, Hispanic, Japanese, or Caucasian (referent category). Respondents reported 1 of 5 educational levels: achieving less than a high school diploma, high school diploma, some college, college degree, through postgraduate education (referent category). SWAN used bleeding patterns to categorize menopausal status: premenopausal (no bleeding irregularity in past 3 months), early perimenopausal (less predictable menses in last 3 months), late perimenopausal (no menstrual bleeding for at least 3 months but no more than 12 months), postmenopausal (no menstrual bleeding for at least 12 months), surgical menopausal (bilateral oophorectomy or hysterectomy), and undetermined (use of hormone therapy or hysterectomy without bilateral oophorectomy before 12 months of amenorrhea). Premenopausal was the referent category. Cigarette smoking was based on current smoking. Body mass index was calculated as weight in kilograms divided by height in meters squared. Depressive symptoms were assessed by the Center for Epidemiologic Studies-Depression (CES-D) scale.²¹ A score of ≥ 16 on the CES-D is considered indicative of clinically significant symptoms.²² A health status variable (2 or more, 1, or no chronic conditions) was created from self-reported information on the presence of diabetes mellitus, high blood pressure, heart attack, arthritis, cancer, and osteoporosis. For analysis, no chronic health conditions was the referent category.

Three hundred seventy-seven women who reported limitations in all role-physical domains at baseline and 180 women who reported moderate or severe pain at baseline were excluded from analysis because we wanted to address longitudinally if a higher level of physical activity was associated with fewer limitations in fulfilling physical roles and lower bodily pain score on the SF-36, and they were already limited in fulfilling their physical roles or were in pain. Eighty-five SWAN subjects had missing data on baseline physical activity, 296 had missing data on the role-physical index, and 293 had missing data on the bodily pain index. Covariate missing data reduced the subjects for the pain outcome analysis by 103 and for the role-physical outcome analysis by 93. For model 1 analysis, $n = 2544$ women for the physical function outcome and $n = 2744$ women for the pain outcome; for model 3, $n = 2451$ and 2641, respectively, after adjusting for missing covariate data.

Data Analysis

Our main approach to analysis for this study was logistic regression using general estimating equations for the time-dependent binary outcomes of the SF-36 role-physical (modeled as

the probability of a woman having high role-physical) and bodily pain (modeled as the probability of a woman having low bodily pain) across the annual examinations as a function of baseline physical activity level. Because of the longitudinal nature of the outcomes (each woman could provide up to 3 responses), we used general estimating equations (GEE).²³ GEEs also account for the correlation among the repeated measures and provide robust estimates of standard error.

Separate analyses were conducted for each outcome. Three models were fitted using time-dependent outcomes (pain and role-physical) and time-dependent covariates (age, BMI, depressive symptoms, smoking, menopausal status, chronic conditions). The covariates site, ethnicity, and education were measured at baseline only. In model 1, we adjusted for site and age. In model 2, we added ethnicity, education, and self-reported menopausal status. In model 3, we added BMI, CES-D, smoking status, and chronic health conditions. Additional post hoc GEE models were run to explore the longitudinal relationship between physical activity level and role-physical scores while adjusting for pain.

Results

Sample Characteristics

As Table 1 shows, at the baseline SWAN visit, just over half of the population was premenopausal and just under half was early perimenopausal with an average age of 45.9 (SD $\pm$ 2.7) and mean BMI of 28.2 (SD $\pm$ 7.2). About one-third of the women had some college education, and 7% had less than a high school education, with the remainder of women divided almost equally between high school diploma, college degree, and post college education. Per the study design, about half of the women were Caucasian, one-quarter African American, and the remaining one-quarter divided between Chinese, Hispanic, and Japanese. Sixteen percent of women suffered with 2 or more chronic conditions, 1 in 6 smoked, and one-quarter had a CES-D score of 16 or higher, indicative of a clinically significant level of depressive symptoms. The average physical activity score at baseline was 5.0 (SD $\pm$ 1.4) of a possible score from 2 to 10. Over the 3 years of follow up, approximately 3 in 10 women had low role-physical scores and one-quarter of participants had high bodily pain scores. (Table 2)

Longitudinal Analysis of Role-Physical and Bodily Pain Subscales

The results of the 3 models for the role-physical index are presented in Table 3. To explore the association between the predictor variable, baseline physical activity score, and the outcome variable, high role-physical, we initially adjusted for site and age (model 1) and found a statistically significant association (OR = 1.15, 95% CI = 1.09–1.19). In model 2, including additional covariates ethnicity, education, and menopausal status, high role-physical was associated with baseline physical activity score (OR = 1.14, 95% CI = 1.08–1.19). Our final model continued to demonstrate statistical significance (OR = 1.07, 95% CI = 1.02–1.13) while adding covariates BMI, CES-D score, smoking, and chronic medical conditions. Table 4 shows similar results for the bodily pain index outcome, demonstrating a significant association between baseline physical activity score and low bodily pain score in all 3 models (model 1 OR = 1.20, 95% CI = 1.14–1.27; model 2 OR = 1.20, 95% CI = 1.13–1.26; model 3 OR = 1.10, 95% CI = 1.04–1.17) using the same covariates as the role-physical analysis. Covariates in analyses for both high role-physical and low bodily pain showed relationships in the expected direction, with odds ratios less than 1 for more chronic health conditions, higher depression scores, and higher BMI in each analysis.

In post hoc analyses, using the total physical activity score, or the active living index and the sports/exercise index individually, as the independent variable was as predictive of the

outcome as the combined sports/exercise and active living indices. However, the association between physical activity level and role-physical score was eliminated in the fully adjusted model (model 3) after adjustment for pain (OR = 1.04, 95% CI = 0.98–1.09; Table 5).

Discussion

Our data positively correlate daily activities and exercise with fewer limitations in fulfilling physical roles and lower bodily pain score on the SF-36 over time in a community-based population of women in their middle years. Although our follow-up time period is short, our longitudinal data suggest that being physically active in daily activities and with sports/exercise might convey a protective effect on problems fulfilling one's functional roles and pain level. As considered in models of disability, we also found that pain mediates the relationship between physical activity and physical role fulfillment.

We chose to study the benefits of being physical active in a community-based sample of midlife women. The benefits of regular, moderate exercise on cardiovascular and musculoskeletal health have been well studied and documented.^{24,25} Moderate exercise studied in this body of work is generally intentional exercise performed at a metabolic equivalent (MET) level of 3 to 6, or with the participant perceiving a moderate level of excursion or moderate elevation of heart rate.²⁵ In particular, exercise has been shown to reduce pain related to musculoskeletal conditions such as osteoarthritis and low back pain in studies of directed exercise and training programs.^{26,27} These programs consisted of range of motion, resistance training, and aerobic walking. We were able to mirror these findings without a specific directed exercise program in a community-based, multiethnic sample of middle-age women during their menopausal transition who self-identified as being more active in daily activities and participating in sports/exercise. We consistently found a positive association between being physically active at baseline and low bodily pain scores over the next 3 years, even in multivariate analysis.

We felt it was important to identify behaviors that might have a protective effect on accomplishments in physical roles, including daily activities and exercise, given the likelihood of progressive disability related to aging. Although physical activity has been related to improved functional status in numerous studies of elderly men and women, SWAN allowed us to test this relationship in a multiethnic population of women at midlife.^{28–30} This positive effect on functional role fulfillment might be related to reducing chronic medical conditions and their sequelae or maintaining physiologic ability to optimize function.^{31–33} A cohort study of middle-age men and women followed over 5 years demonstrated that physical limitations were higher among women than men and that physically active individuals reported fewer functional limitations than their less active counterparts.³⁴ Moderate physical exercise with a directed program designed to enhance cardiovascular fitness, muscular endurance, and flexibility was associated with improved functional abilities in patients with fibromyalgia.³⁵

We identified a robust, positive relationship between physical activity level and high role-physical over the subsequent 3 years in keeping with these previous studies but also had the opportunity to include pain as a covariate in the multivariate model in post hoc analyses. These additional analyses controlling for pain revealed that pain mediates the relationship between physical activity level and problems fulfilling one's physical role, as would be expected in the WHO models of disability, the disease handicap model, and the more recent disablement process model reviewed in the introduction.^{2,4,5} This might be related to the exacerbation of pain with physical activity causing additional impairments or functional limitations, leading to greater disability. These findings support the need to assess pain and

provide adequate pain control for painful conditions as a means of at least preserving or possibly enhancing one's functional status related to physical activity level.

Strengths and Limitations

A major limitation of the current study is the use of self-report recall surveys for both the exposure (physical activity score) and outcome (role-physical and pain scores) variables. Furthermore, we do not have specific information on the anatomic location of pain or associated impairments, which would provide a better means of considering the disablement process. We would have been interested in using the SF-36 Physical Functioning Index as a longitudinal outcome variable; however, this was not included in the annual SWAN follow-up surveys. Although we controlled for socioeconomic status and depressive symptoms, we do not have data on social support and other environmental issues (eg, physical barriers) that can lead to disability. The study strengths include the community setting, multiethnic population, and longitudinal design. In addition, the inclusion of both pain and role-physical indices allows us to begin to evaluate the disablement process model in a community setting.

Conclusion

Our findings provide yet another strong argument for public health and clinical programs that promote physical activity (daily activities such as walking or biking) and exercise (intentional bouts of brisk walking, running, or sports participation) for women who are community dwelling. Additional research is needed to explore if men would respond similarly. Although age-related decline in physical function and increase in pain may be considered inevitable, motivating women to increase or at least maintain their exercise and active living behaviors during their middle years can positively modify these trends. The protective role of physical activity in midlife women in our analysis mirrors the chronic disease prevention model of exercise in cardiovascular disease.³⁶ However, we need further studies to assess for a dose-response relationship as seen with other health outcomes positively impacted by active lifestyles.³⁷

The very practical message of the benefits of physical activity and exercise from this study might resonate with a wide range of women in midlife who are facing pain and functional decline in their daily lives. These women should be made aware of their future potential for disability and the importance of regular physical activity in combating against this. Because pain was shown to mediate the positive relationship between physical activity and role-physical fulfillment, practitioners prescribing physical activity for disability prevention should also address pain management issues in individuals for whom pain is an active health issue. More important, practitioners should start the encouragement of being physically active at an early age and continue to deliver the message.

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Table 1

Characteristics of Participants From the Study of Women's Health Across the Nation (SWAN)

At baseline SWAN visit	Frequency (n = 3205)	%	Mean	SD
Menopausal status (missing = 77)				
premenopausal	1675	54		
early perimenopausal	1453	46		
Educational status (missing = 29)				
less than high school diploma	224	7		
high school diploma	565	18		
some college	1022	32		
college degree	645	20		
post college education	720	23		
Age (y)			45.9	2.7
Ethnicity				
African American	895	28		
Caucasian	1520	47		
Chinese	236	7		
Hispanic	278	9		
Japanese	276	9		
Chronic conditions ^a (missing = 6)	1684	16		
2 or more	1001	31		
1	514	53		
none				
Current smoker (missing = 28)	551	17		
Body mass index (kg/m ² ; missing = 42)			28.2	7.2
CES-D score = depressed (missing = 3)	773	24		
Physical activity score			5.0	1.5

Abbreviation: CES-D, Center for Epidemiological Studies-Depression.

^aChronic conditions includes answering affirmatively to questions about ever having diabetes, hypertension, myocardial infarction, osteoarthritis, cancer, or osteoporosis.

Table 2

Role-Physical and Pain Scores of Participants From the Study of Women's Health Across the Nation (SWAN)

	Frequency	%
Role-Physical Score		
Follow-up year 01	(n = 2419)	
low role-physical	711	29
high role-physical	1708	71
Follow-up year 02	(n = 2287)	
low role-physical	677	30
high role-physical	1610	70
Follow-up year 03	(n = 2220)	
low role-physical	694	31
high role-physical	1526	69
Pain Score		
Follow-up year 01	(n = 2612)	
high bodily pain	574	22
low bodily pain	2038	78
Follow-up year 02	(n = 2465)	
high bodily pain	595	24
low bodily pain	1870	76
Follow-up year 03	(n = 2393)	
high bodily pain	551	23
low bodily pain	1842	77

Table 3

Odds Ratios for High Level of Function on SF-36 Role-Physical Index Over 3 Years by Baseline Physical Activity Total Score in SWAN Subjects in Adjusted Models

	Model 1^a OR (95% CI)	Model 2^b OR (95% CI)	Model 3^c OR (95% CI)
Physical activity at baseline	1.15 (1.09–1.19)	1.14 (1.08–1.19)	1.07 (1.02–1.13)
Age at baseline	0.97 (0.95–0.99)	0.98 (0.96–1.01)	0.99 (0.96–1.01)
Black		0.88 (0.73–1.05)	0.97 (0.81–1.16)
Chinese		1.16 (0.82–1.64)	0.88 (0.62–1.26)
Hispanic		1.59 (1.00–2.51)	1.74 (1.06–1.85)
Japanese		1.34 (0.97–1.85)	1.17 (0.86–1.61)
Caucasian		referent	referent
Undetermined menopausal status		0.62 (0.49–0.77)	0.66 (0.52–0.84)
Postmenopausal		0.67 (0.51–0.88)	0.75 (0.56–1.00)
Late perimenopausal		0.71 (0.55–0.92)	0.80 (0.61–1.05)
Early perimenopausal		0.78 (0.67–0.92)	0.85 (0.72–1.01)
Premenopausal		referent	referent
Body mass index			0.97 (0.96–0.98)
CES-D score			0.39 (0.34–0.46)
2 or more chronic health conditions ^d			0.46 (0.37–0.57)
1 chronic health condition			0.66 (0.56–0.76)
No chronic health conditions			referent

Abbreviation: CES-D, Center for Epidemiological Studies-Depression.

^a Age/site adjusted.

^b Model 1 + ethnicity, education level, self-reported menstrual status.

^c Model 2 + CES-D, body mass index, smoking, chronic health conditions.

^d Chronic health conditions includes answering affirmatively to questions about ever having diabetes, hypertension, myocardial infarct, osteoarthritis, cancer, and osteoporosis.

Table 4

Odds Ratios for Low Level of Pain on SF-36 Pain Index Over 3 Years by Baseline Physical Activity Total Score in SWAN Subjects in Adjusted Models

	Model 1^a OR (95% CI)	Model 2^b OR (95% CI)	Model 3^c OR (95% CI)
Physical activity at baseline	1.20 (1.14–1.27)	1.20 (1.13–1.26)	1.10 (1.04–1.17)
Age at baseline	0.96 (0.94–0.98)	0.97 (0.95–0.99)	0.98 (0.95–1.01)
Black		0.93 (0.78–1.14)	1.04 (0.85–1.27)
Chinese		1.53 (1.05–2.22)	1.03 (0.71–1.51)
Hispanic		0.64 (0.39–1.03)	0.68 (0.41–1.14)
Japanese		1.02 (0.70–1.48)	0.79 (0.55–1.14)
Caucasian		referent	referent
Less than high school diploma		0.55 (0.39–0.79)	0.69 (0.48–0.98)
High school diploma		0.86 (0.68–1.09)	1.09 (0.86–1.39)
Some college		0.70 (0.58–0.85)	0.82 (0.67–1.00)
College diploma		0.88 (0.71–1.10)	0.92 (0.73–1.16)
Post college education		referent	referent
Undetermined menopausal status		0.64 (0.51–0.82)	0.71 (0.55–0.92)
Postmenopausal		0.78 (0.59–1.05)	0.95 (0.69–1.29)
Late perimenopausal		0.79 (0.62–1.03)	0.96 (0.72–1.27)
Early perimenopausal		0.82 (0.69–0.98)	0.92 (0.77–1.11)
Premenopausal		referent	referent
Body mass index			0.97 (0.96–0.98)
CES-D scale			0.42 (0.36–0.49)
Smoking			0.75 (0.62–0.91)
2 or more chronic health conditions ^d			0.36 (0.29–0.44)
1 chronic health condition			0.58 (0.49–0.68)
No chronic health conditions			referent

Abbreviation: CES-D, Center for Epidemiological Studies-Depression.

^a Age/site adjusted.

^b Model 1 + ethnicity, education level, self-reported menstrual status.

^c Model 2 + CES-D, body mass index, smoking, chronic health conditions.

^d Chronic health conditions includes answering affirmatively to questions about ever having diabetes, hypertension, myocardial infarct, osteoarthritis, cancer, and osteoporosis.

Table 5

Odds Ratios for High Level of Function on SF-36 Role-Physical Index Over 3 Years by Baseline Physical Activity Total Score in SWAN Subjects in Models Adjusted for Pain

	Model 1^a OR (95% CI)	Model 2^b OR (95% CI)	Model 3^c OR (95% CI)
Physical activity at baseline	1.07 (1.02–1.12)	1.08 (1.03–1.13)	1.04 (0.98–1.09)
Age at baseline	0.98 (0.96–1.00)	0.99 (0.97–1.02)	0.99 (0.96–1.02)
Pain level	6.07 (5.27–6.99)	5.92 (5.12–6.85)	5.29 (4.54–6.16)
Black		0.92 (0.77–1.01)	0.98 (0.81–1.17)
Chinese		1.14 (0.78–1.65)	0.93 (0.63–1.37)
Hispanic		1.76 (1.09–2.84)	1.88 (1.09–3.24)
Japanese		1.33 (0.96–1.84)	1.22 (0.88–1.69)
Caucasian		referent	referent
Undetermined menopausal status		0.64 (0.50–0.82)	0.67 (0.51–0.86)
Postmenopausal		0.67 (0.50–0.89)	0.71 (0.52–0.96)
Late perimenopausal		0.69 (0.53–0.91)	0.75 (0.56–1.00)
Early perimenopausal		0.80 (0.67–0.95)	0.84 (0.71–1.01)
Premenopausal		referent	referent
Body mass index			0.98 (0.97–0.99)
CES-D			0.48 (0.40–0.56)
2 or more chronic health conditions ^d			0.62 (0.49–0.77)
1 chronic health condition			0.77 (0.66–0.90)
No chronic health conditions			referent

Abbreviation: CES-D, Center for Epidemiological Studies-Depression.

^a Age/site adjusted.

^b Model 1 + ethnicity, education level, self-reported menstrual status.

^c Model 2 + CES-D, body mass index, smoking, chronic health conditions.

^d Chronic health conditions includes answering affirmatively to questions about ever having diabetes, hypertension, myocardial infarct, osteoarthritis, cancer, and osteoporosis.

Appendix

Physical Activity Subscales Used in SWAN Active Living Index

During the past year, when you were not working or doing chores around the house ...

1. Did you watch television (CIRCLE ONE ANSWER)

Never or less than 1 hour a week	1
At least 1 hour/week but less than 1 hour a day	2
1–2 hours a day	3
2–4 hours a day	4
More than 4 hours a day	5
2. Did you walk or bike to and from work, school, or errands (CIRCLE ONE ANSWER)

Never or less than 5 minutes per day	1
5–15 minutes per day	2
10–30 minutes per day	3
31–45 minutes per day	4
More than 45 minutes per day	5

Sports Index

During the past year, when you were not working or doing chores around the house ...

1. Did you play sports or exercise (CIRCLE ONE ANSWER)

Never	1
Less than once a month	2
Once a month	3
2–3 times a month	4
Once a week	5
More than once a week	6

Which sport or exercise did you do **most frequently during the past year**? (SPECIFY ONLY ONE) _____

2. When you did this activity, did your heart rate and breathing increase? (CIRCLE ONE ANSWER)

No	1
Yes, a small increase	2
Yes, a moderate increase	3
Yes, a large increase	4
 3. How many months in this past year did you do this activity? (CIRCLE ONE ANSWER)

Less than 1 month	1
1–3 months	2
4–6 months	3
7–9 months	4
More than 9 months	5
 4. During these months, on average, how many hours a week did you do this activity? (CIRCLE ONE ANSWER)

Less than 1 hour	1
At least 1 but less than 2 hours	2
At least 2 but less than 3 hours	3
At least 3 but less than 4 hours	4
More than 4 hours	5
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