Association of Self-Reported Frequent Exercise Among a Nationally-Representative Sample of Older People in the United States with Self-Reported Pain

Abstract

This retrospective, cross-sectional database study aimed to identify characteristics associated with self-reported frequent exercise (defined as moderate-vigorous intensity exercise for ≥30 minutes five times a week) in older United States (≥50 years) adults with pain in the past four weeks, using 2017 Medical Expenditure Panel Survey data and hierarchical logistic regression models. Variables significantly associated with frequent exercise included: being male (adjusted odds ratio [AOR]=1.507, 95% confidence interval [CI]=1.318-1.724); non-Hispanic (AOR=1.282, 95% CI=1.021, 1.608); employed (AOR=1.274, 95% CI=1.040-1.560); having no chronic conditions versus ≥5 conditions (AOR=1.576, 95% CI=1.094-2.268); two chronic conditions versus ≥5 conditions (AOR=1.547, 95% CI=1.226-1.952); no limitation versus having a limitation (AOR=1.209, 95% CI=1.015-1.441); little/moderate versus quite/extreme pain (AOR=1.358, 95% CI=1.137-1.621); excellent/very good versus fair/poor physical health (AOR=2.408, 95% CI=1.875-3.093); and good versus fair/poor physical health (AOR=1.337, 95% CI=1.087-1.646). These characteristics may be useful to create personalized pain management protocols that include exercise for older adults with pain.

Key Words

Exercise; older adult; pain management

The older adult population in the United States (US) is increasing rapidly, with those aged 65 years and older comprising over 15% of the population in 2016 (US Census Bureau 2017). Among older adults, pain is associated with disability from various conditions (Reid, Eccleston & Pillemer, 2015). Pain can be described as an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage (International Association for the Study of Pain, 1994). Further research into effective pain management strategies is warranted given the increasing number of older adults and the consequences of uncontrolled pain.

Several pharmacological and non-pharmacological strategies exist to manage pain (Axon, Bhattacharjee, Warholak & Slack, 2018, Axon, Patel, Martin & Slack, 2019). For example, one common pharmacological strategy is opioid medications. However, the opioid overdose epidemic and side effect profile associated with these drugs in older adults makes them a less desirable option (Resnick et al., 2019, US Department of Health & Human services, 2017). Other pharmacological agents for pain management typically have poor to modest efficacy (Ambrose & Golightly, 2015). Non-pharmacological strategies, such as exercise, have increased in popularity for pain management in recent years (Alghadir, Anwer, Sarkar, Paul & Anwar, 2019). The Department of Health and Human Services recommends at least 150 minutes a week of moderate activity or 75 minutes a week of vigorous activity for most people (Health.Gov, 2020). In addition to the general benefits of exercise such as losing weight, improving sleep, boosting energy, and improving mental health, exercise may help improve pain management (Franzke, Neubauer, Cameron-Smith & Wagner, 2018).

Several studies have investigated the impact of physical activity on pain in the general population (Ambrose & Golightly, 2015, Hagen et al., 2012). Among older adults, one study

showed that exercise in patients aged 65 years and older resulted in improved back-pain scores over two years (scores decreased from 5 to 3 on a 0-10 scale, $p<0.001$) (Mailloux, Finno & Rainville, 2006). Another study demonstrated improvement in muscle health with high intensity resistance exercise in older adults (Berry et al., 2019), while another study reported that patients aged 50-70 years may be interested in green exercise (outdoor in nature) as part of their treatment regime to manage pain and improve their mood (Selby, Hayes, O'Sullivan, O'Neil & Harmon, 2018).

In particular, a recent review explored the outcomes and safety of four categories of exercise: aerobic exercise, strength training, flexibility training, and movement therapies (Ambrose & Golightly, 2015). This review found aerobic exercise can improve pain, with greater intensity exercise leading to greater improvements in pain. The same review also found strength training is effective and safe for chronic pain management, flexibility training has a modest benefit for chronic pain management, while movement therapies, although typically performed at lower intensities than the other categories, are also safe and effective for pain management (Ambrose & Golightly, 2015). A Cochrane review found that exercise generally had a positive impact on pain severity, although there were inconsistent changes in pain severity across different exercises (Geneen et al., 2017).

A recent meta-analysis of randomized controlled trials of physical activity or exercise found a positive correlation with exercise duration and analgesic effect on neck pain in particular, and additional multiple linear regression analyses identified increasing exercise frequency was associated with greater likelihood of a positive effect on chronic pain patients (Polaski, Phelps, Kostek, Szucs & Kolber, 2019). Another meta-analysis of cohort and cross-sectional studies of adults with lower back pain concluded that physical activity was associated

with lower prevalence of lower back pain (Alzahrani, Mackey, Stamatakis, Zadro & Shirley, 2019).

The characteristics associated with self-reported exercise among older people in the US with self-reported pain are not known, yet this information might be useful to help develop personalized pain management protocols that include exercise as an appropriate pain management strategy. Therefore, this study aimed to identify the characteristics associated with self-reported exercise among a nationally representative sample of older people in the US with self-reported pain.

Methods

Study design and data source:

This retrospective, cross-sectional study design utilized the most recent publicly available 2017 Medical Expenditure Panel Survey (MEPS) data (Agency for Healthcare Research and Quality, 2019b). MEPS was selected as the data source because it contains many useful variables and allows nationally-representative estimates to be calculated. MEPS data are collected over two calendar years via multiple interview rounds using the sampling framework from the previous years' National Health Interview Survey (NHIS). MEPS data are able to provide nationally representative estimates of the non-institutionalized US population due to purposeful oversampling of disabled and minority groups. There are three core components to MEPS; the household component, the insurance component, and the medical provider component. This study used the MEPS household component which contains detailed data about each person in the households surveyed, including demographic characteristics, employment and income details, health insurance coverage, health conditions and health status, healthcare utilization and costs, and access and satisfaction with healthcare. (Agency for Healthcare Research and Quality, 2019a). MEPS is reviewed and approved by an Institutional Review Board annually, and participants provide oral informed consent to voluntarily participate. This study was approved by The University of XXX Institutional Review Board.

Participant eligibility:

Participants in the MEPS 2017 full-year consolidated data file were eligible for study inclusion if they were alive for the full calendar year, age 50 years or older, and reported having pain in the past four weeks. Pain was specified by a response of "little bit", "moderately", "quite a bit", or "extremely", when asked, "During the past 4 weeks, pain interfered with normal work

outside the home and housework" (Agency for Healthcare Research and Quality, 2019c, Agency for Healthcare Research and Quality, 2019d).

Independent variables:

Five groups of independent variables (classified using Andersen's Behavioral Model) were assessed in this study (Andersen, 1995).

(1) Predisposing factors consisted of: age in years (50-64, ≥65); gender (male, female); ethnicity (Hispanic, non-Hispanic); and race (white, other).

(2) Enabling factors included: education completed (< high school, high school, > high school); employment status (employed, unemployed); income level (this served as an indicator of poverty level; poor/near poor/low income [<200% federal poverty level], middle/high income [≥200% federal poverty level]); insurance coverage (private, public, uninsured); and marital status (married, other).

(3) Need factors were: number of chronic conditions (summed from the following list of highly-prevalent conditions available in MEPS: angina, arthritis, asthma, cancer, chronic bronchitis, coronary heart disease, diabetes, joint pain, emphysema, hypercholesterolemia, hypertension, myocardial infarction, other unspecified heart disease, and stroke; 0, 1, 2 , 3, 4, ≥5); any limitation (including any type of activity of daily living, instrumental activity of daily living, functional, or activity limitation; yes, no); pain severity (little/moderate, quite a bit/extreme); perceived mental health status (excellent/very good, good, fair/poor); and perceived physical health status (excellent/very good, good, fair/poor).

(4) The only personal health practices factor was smoking status (yes, no).

(5) The only external environmental factor was census region (Midwest, Northeast, South, West) (Agency for Healthcare Research and Quality, 2019c, Agency for Healthcare Research and Quality, 2019d).

Dependent variable:

Exercise status served as the dependent variable in our study. Exercise status was analyzed dichotomously (yes or no) depending on whether the participant reported that they participated in at least 30 minutes of moderate to vigorous intensity physical activity at least five times per week (Agency for Healthcare Research and Quality, 2019c, Agency for Healthcare Research and Quality, 2019d).

Data analysis:

The MEPS cluster, strata, and weighting variables were used to account for the complexity of the MEPS design and to generate nationally-representative population estimates. Nominal data were compared using chi-square tests. Hierarchical logistic regression models, whereby an additional group of variables (predisposing, enabling, need, personal health practices, and external environmental factors) were added to each successive model, were used to determine statistically significant associations with exercise status. Participants who exercised regularly were modelled, while those who did not exercise regularly served as the referent group. Standard errors were calculated using the Taylor-series linearization approach. An alpha level of 0.05 was set a priori. Missing data for some variables are inputted by MEPS staff where possible; any missing data remaining were excluded from analyses. Analyses were conducted using SAS Studio 3.8 (SAS institute Inc., Cary, NC, USA).

Results

From a total of 31,880 participants available in the 2017 MEPS dataset, 5,051 were eligible for inclusion in this study (exercise status: yes=2,050, no=3,001). From a weighted population of 56,751,256, 41.9% (95% confidence interval [CI]=40.0%, 43.7%) reported doing moderate to vigorous intensity exercise for at least 30 minutes five times a week.

Table 1 outlines the characteristics of study participants stratified by self-reported exercise status. Approximately half (51%) the participants were aged ≥65 years, and the majority (>50%) were: female, non-Hispanic, white, educated beyond high school, unemployed, had middle/high income, private insurance coverage, married, ≥4 chronic conditions, any limitation, little/moderate pain severity, good/very good/excellent mental and physical health, and did not smoke. The most common census region was the southern states of the US (38%). There were differences between those who reported doing frequent exercise and those who did not for all characteristics ($p<0.05$) except race ($p=0.9738$).

Table 2 displays the results of the logistic regression analyses. Among predisposing and enabling characteristics, males (versus females) were approximately 1.5 times more likely (adjusted odds ratio [AOR]=1.507, 95% CI=1.318, 1.724) to report doing exercise. Those who were non-Hispanic (versus Hispanic) and those who were employed (versus unemployed) were approximately 1.3 times more likely to report doing exercise (AOR=1.282, 95% CI=1.021, 1.608 and AOR=1.274, 95% CI=1.040, 1.560 respectively).

Among need factors, 0 versus ≥5 and 2 versus ≥5 chronic conditions were associated with self-reported exercise (AOR=1.576, 95% CI=1.094, 2.268 and AOR=1.547, 95% CI=1.226, 1.952 respectively). Not having any limitation (versus having a limitation) was also associated with a greater likelihood of reporting doing exercise (AOR=1.209, 95% CI=1.015, 1.441), as was

reporting little/moderate pain severity (versus quite a bit/extreme pain severity) was also associated with self-reported exercise (AOR=1.358, 95% CI=1.137, 1.621), excellent/very good and good (versus fair/poor) perceived physical health status (AOR=2.408, 95% CI=1.875, 3.093 and AOR=1.337, 95% CI=1.087, 1.646 respectively).

None of the personal health practices or external environmental factors were associated with self-reported exercise. The fully-adjusted logistic regression models had a Wald statistic of <0.0001 and a c-statistic of 0.660.

Discussion

This study identified several predisposing, enabling, and need factors that were associated with reporting frequent exercise (i.e., 30 minutes of moderate to vigorous intensity physical activity at least five times per week) among older US adults with self-reported pain. None of the personal health practices or external environmental factors were associated with self-reported exercise.

This study also found that 41.9% of older US adults with pain reported doing moderate to vigorous intensity exercise for at least 30 minutes five times a week. In another study of three databases, the proportion of US adults aged 65 years and older who reported 150 minutes of moderate to vigorous intensity exercise each week was 27.3% in the National Health and Nutrition Examination Survey (NHANES) 2011-12 dataset, 35.8% in the National Health Interview Survey (NHIS) 2013 dataset, and 44.3% in the Behavioral Risk Factor Surveillance System (BRFSS) 2013 dataset (Keadle, McKinnon, Graubard & Troiano, 2016). The findings in the current study are within this previously reported range, however the current study included adults aged at least 50 years and also controlled for several additional factors beyond age, gender, and race/ethnicity (Keadle, McKinnon, Graubard & Troiano, 2016).

Predisposing factors:

Among the predisposing factors that were evaluated, gender and ethnicity were associated with reporting frequent exercise, yet age and race were not. In terms of gender, the literature suggests that men are generally more active than women in the general population, which is consistent with the findings of our study (Rhoades, 2005, Van Domelen et al., 2011). Although, a study in a Belgium population found physical inactivity increased among men as they aged (Spittaels et al., 2012). Research also indicates that the motivation for exercise appears

to differ between genders, with one study of young adults (mean age 18 years for female and 37 years for men) reporting that men were likely to exercise for enjoyment whereas women reported exercising for weight loss and toning (Craft, Carroll & Lustyk, 2014). However, future research is needed to determine if these reasons for exercise still apply among older adults with pain.

With respect to ethnicity, our findings also support existing literature. For example, one study using data from the American Time Use Survey (ATUS) concluded that physical activity is significantly higher among non-Hispanic individuals than any other groups (Saffer, Dave, Grossman & Leung, 2013).

Our study found age was not associated with self-reported exercise. This is interesting when compared with existing knowledge of age and exercise; for example, one study that also used MEPS data (albeit from 2002) showed younger adults in the general population were more likely to report physical activity at least three times per week for half an hour or more compared to the older generations (Rhoades, 2005). More recent studies suggest that physical activity remains low in older adults (McPhee et al., 2016). For example, physical inactivity was reported among at least a third of the 65-74 age group and half of the 75 and older group (Anderson & Durstine, 2019).

Enabling factors:

The only enabling factor that was associated with self-reported frequent exercise in our study was employment status. Although we might consider this a logical conclusion given that older adults who are unemployed might be retired, it is interesting that employed individuals in our study were more likely to report doing exercise than those not employed, yet age was not associated with self-reported exercise. Previous data from the 2003-04 National Health and Nutrition Examination Survey (NHANES) showed that full-time employment in men (average

age 41.4 years) had a positive association with physical activity and exercise compared to those who were unemployed (Van Domelen et al., 2011), which is similar to the findings of our study.

Need factors:

Our study found that the number of chronic conditions an individual had was associated with self-reported frequent exercise. Individuals with 0 and 2 chronic conditions were approximately 1.5 times more likely to report doing exercise frequently compared to individuals with 5 or more chronic conditions. Previous research has indicated that incorporating a daily exercise routine can decrease the risk of chronic disease mortality in the general population (Goenka & Lee, 2017, Lear et al., 2017, Webber, Strachan & Pachu, 2017), and the benefit of exercise among older adults continues to be investigated (Centers for Disease Control and Prevention, 2020, World Health Organization, 2020).

We also found that not having a limitation (versus having a limitation) or little/moderate pain (versus quite a bit/extreme pain) was associated with a greater likelihood of reporting frequent exercise. Although it might seem difficult for someone with a limitation to incorporate 150 minutes of moderate to vigorous exercise per week, one study showed that a scheduled session of exercise can boost energy and have substantial physical and psychological benefits (Musumeci, 2015).

In terms of pain severity, our findings may be explained by those from a United Kingdom study that reported low levels of pain were associated with doing typical physical activities rather than moderate or vigorous intensity activities (Park, Thøgersen-Ntoumani, Veldhuijzen van Zanten & Ntoumanis, 2017).

Finally, our study also showed that compared to the fair/poor group, those with excellent, very good, or good perceived physical health were more likely to report doing exercise

frequently. These findings may be useful for clinicians working with older adults to discuss the possibility of incorporating exercise into their pain management routines. However, more research is necessary to determine the type of exercise such populations should engage in to maximize their health benefits.

Limitations:

This study is subject to some limitations, in particular lack of a causal relationship by nature of the study design, and recall bias from the MEPS interview design. In addition, the large nationally-representative sample may have resulted in a lack of significance between comparison groups. The self-reported nature of exercise may have biased the true level of exercise undertaken by this population. Many of the variables were dichotomous (including the dependent variable, exercise status), potentially resulting in less detailed information and less power than continuous data. Finally, some groups of variables contained several variables, whereas others only contained one variable (e.g., external environmental characteristics), thus it was more difficult to identify the specific variables that influenced the analytical models in the groups with several variables.

Conclusions

This cross-sectional study of approximately 57 million older US adults with pain identified predisposing, enabling and need factors associated with self-reported frequent moderate-vigorous exercise for 30 minutes a day at least 5 times a week. Factors associated with a greater likelihood of self-reported frequent exercise included: being male, non-Hispanic, employed, having no chronic conditions versus ≥5 conditions, having two chronic conditions versus ≥5 conditions, having no limitation versus having a limitation, reporting little/moderate versus quite/extreme pain, and reporting excellent, very good, or good versus fair or poor physical health. This information could be useful for older adults with pain and their clinicians who are considering adding exercise to their pain management routines.

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Table 1.

Characteristics of United States Older Adults (age ≥50 years) with Self-Reported Pain in the Past Four Weeks, Stratified by Exercise and No Exercise

Variables	Total (Weighted N=56,751,256) Weighted % (95% CI)	Exercise (Weighted N=23,758,914) Weighted % (95% CI)	No Exercise (Weighted N=32,992,342) Weighted % (95% CI)	p
Predisposing factors:				
Age (years)				0.0012
50-64	49.0 (46.9-51.0)	52.3 (49.4-55.2)	46.6 (44.1-49.1)	
≥65	51.0 (49.0-53.1)	47.7 (44.8-50.6)	53.4 (50.9-55.9)	
Gender				<0.0001
Male	44.6 (43.3-46.0)	50.2 (47.9-52.4)	40.7 (38.9-42.5)	
Female	55.4 (54.0-56.7)	49.8 (47.6-52.1)	59.3 (57.5-61.1)	
Ethnicity				0.0167
Hispanic	10.1 (8.8-11.4)	8.9 (7.5-10.4)	11.0 (9.4-12.5)	
Non-Hispanic	89.9 (88.6-91.2)	91.1 (89.6-92.5)	89.0 (87.5-90.6)	
Race				0.9738
White	81.2 (79.6-82.8)	81.2 (79.2-83.3)	81.2 (79.3-83.1)	
Other	18.8 (17.2-20.4)	18.8 (16.7-20.8)	18.8 (16.9-20.7)	
Enabling factors:				
Education completed				0.0009
< High school	16.3 (14.8-17.8)	13.9 (12.2-15.6)	18.0 (16.1-20.0)	
High school	32.9 (31.3-34.5)	32.4 (30.0-34.8)	33.2 (31.2-35.3)	
> High school	50.8 (48.8-52.9)	53.7 (51.0-56.5)	48.8 (46.2-51.4)	
Employment status				<0.0001
Employed	38.9 (36.7-41.1)	46.9 (43.9-50.0)	33.2 (30.6-35.7)	
Unemployed	61.1 (58.9-63.3)	53.1 (50.0-56.1)	66.8 (64.3-69.4)	
Income level				<0.0001
Poor/near poor/low income	32.2 (30.3-34.2)	28.1 (25.5-30.6)	35.2 (32.7-37.7)	
Middle/high income	67.8 (65.8-69.7)	71.9 (69.4-74.5)	64.8 (62.3-67.3)	
Insurance coverage				<0.0001
Private	61.0 (59.1-62.9)	65.1 (62.6-67.6)	58.0 (55.6-60.4)	
Public	35.5 (33.7-37.3)	31.0 (28.6-33.4)	38.7 (36.4-41.0)	
Uninsured	3.6 (2.9-4.2)	3.9 (2.9-4.9)	3.3 (2.6-4.0)	
Marital status				0.0075

Married	57.2 (55.1-59.3)	60.1 (57.2-63.0)	55.1 (52.5-57.7)	
Other	42.8 (40.7-44.9)	39.9 (37.0-42.8)	45.0 (42.3-47.6)	
Need factors:				
Chronic conditions				<0.0001
0	4.8 (4.0-5.6)	6.9 (5.4-8.4)	3.4 (2.6-4.1)	
1	10.0 (9.0-11.0)	11.3 (9.6-13.0)	9.1 (7.8-10.3)	
2	15.7 (14.3-17.0)	19.5 (17.3-21.8)	12.9 (11.3-14.5)	
3	18.8 (17.6-20.1)	19.3 (17.4-21.3)	18.5 (16.7-20.3)	
4	16.6 (15.4-17.7)	15.6 (13.9-17.3)	17.3 (15.7-18.9)	
≥5	34.1 (32.4-35.8)	27.4 (25.2-29.6)	38.9 (36.6-41.2)	
Any limitation				<0.0001
Yes	50.8 (49.0-52.7)	41.7 (39.0-44.4)	57.4 (55.0-59.9)	
No	49.2 (47.3-51.0)	58.3 (55.6-61.0)	42.6 (40.1-45.0)	
Pain severity				<0.0001
Little/moderate	75.5 (73.2-76.7)	82.9 (81.0-84.7)	69.3 (67.0-71.6)	
Quite a bit/extreme	25.0 (23.3-26.8)	17.1 (15.3-19.0)	30.7 (28.4-33.0)	
Perceived mental health status				<0.0001
Excellent/very good	52.2 (50.3-54.1)	60.4 (57.8-63.0)	46.2 (43.9-48.6)	
Good	33.4 (31.6-35.1)	29.5 (27.0-32.0)	36.1 (34.0-38.3)	
Fair/poor	14.5 (13.3-15.6)	10.1 (8.7-11.5)	17.6 (15.9-19.3)	
Perceived physical health status				<0.0001
Excellent/very good	35.5 (33.9-37.2)	47.5 (44.9-50.1)	27.0 (24.9-29.0)	
Good	37.5 (35.9-39.1)	34.5 (32.2-36.8)	39.6 (37.4-41.7)	
Fair/poor	27.0 (25.5-28.5)	18.0 (16.1-19.9)	33.5 (31.2-35.7)	
Personal health practices factors:				
Smoking status				0.0431
Yes	14.8 (13.7-15.9)	13.4(11.7-15.2)	15.8 (14.3-17.2)	
No	85.2 (84.1-86.3)	86.6 (84.8-88.3)	84.2 (82.8-85.7)	
External environmental factors:				
Census region				0.0358
Midwest	22.0 (20.2-23.8)	23.4 (20.9-26.0)	21.0 (18.9-23.2)	
Northeast	18.2 (16.5-19.9)	17.9 (15.5-20.2)	18.5 (16.4-20.6)	
South	38.3 (36.2-40.4)	35.5 (32.5-38.5)	40.2 (37.5-43.0)	
West	21.5 (19.7-23.3)	23.2 (20.7-25.7)	20.3 (17.9-22.6)	

1 Analyses based on 5,051 (un-weighted) older United States adults (age ≥50 years) alive during

2 the calendar year 2017 with self-reported pain in the past four weeks. Differences between the

exercise group (un-weighted n=2,050) and no exercise group (un-weighted n=3,001)] based on chi-square tests. Abbreviations: % = percentage; CI = confidence interval.

Table 2.

Association of Self-Reported Frequent (≥5 times per week) Moderate-Vigorous Intensity Exercise for 30 Minutes Among Older United States Adults (age ≥50 years) With Pain in the Past Four Weeks

Variables	Adjusted odds ratio	95% Confidence Interval
Predisposing factors:		
Age (years)		
50-64 vs. ≥65	1.042	(0.874-1.243)
Gender		
Male vs. female	**1.507**	**(1.318-1.724)**
Ethnicity		
Hispanic vs. non-Hispanic	**0.780**	**(0.622-0.979)**
Race		
White vs. other	0.885	(0.742-1.055)
Enabling factors:		
Education completed		
< High school vs. > high school	1.011	(0.806-1.267)
High school vs. > high school	1.032	(0.870-1.225)
Employment status		
Employed vs. unemployed	**1.274**	**(1.040-1.560)**
Income level		
Poor/near poor/low income vs. middle/high income	1.096	(0.909-1.321)
Insurance coverage		
Private vs. uninsured	0.874	(0.605-1.264)
Public vs. uninsured	0.906	(0.622-1.320)
Marital status		
Married vs. other	0.966	(0.814-1.146)
Need factors:		
Chronic conditions		
0 vs. ≥5	**1.576**	**(1.094-2.268)**
1 vs. ≥5	1.054	(0.782-1.421)
2 vs. ≥5	**1.547**	**(1.226-1.952)**
3 vs. ≥5	1.094	(0.884-1.353)
4 vs. ≥5	0.988	(0.808-1.208)
Any limitation		
Yes vs. no	**0.827**	**(0.694-0.985)**
Pain severity		
Little/moderate vs. quite a bit/extreme	**1.358**	**(1.137-1.621)**
Perceived mental health status		
Excellent/very good vs. fair/poor	1.106	(0.865-1.414)
Good vs. fair/poor	1.061	(0.836-1.347)

Perceived physical health status		
Excellent/very good vs. fair/poor	**2.408**	**(1.875-3.093)**
Good vs. fair/poor	**1.337**	**(1.087-1.646)**
Personal health practices factors:		
Smoking status		
Yes vs. no	0.912	(0.730-1.139)
External environmental factors:		
Census region		
Midwest vs. West	0.970	(0.758-1.241)
Northeast vs. West	0.801	(0.621-1.034)
South vs. West	0.822	(0.653-1.035)

Analyses based on 5,051 (un-weighted) older United States adults (age ≥50 years) alive during the calendar year 2017 with self-reported pain in the past four weeks. The reference group for the dependent variable in the logistic regression was 'no exercise' (N=3,001). The model had a Wald statistic of $p<0.0001$ and a c-statistic of 0.660. Bold indicates the variable was statistically associated with self-reported exercise.