Accepted Manuscript

Physical and psychosocial factors in the prevention of chronic pain in older age

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PII: S1526-5900(18)30304-3
DOI: 10.1016/j.jpain.2018.06.001
Reference: YJPAI 3597

To appear in: Journal of Pain

Received date: 1 May 2018
Revised date: 29 May 2018
Accepted date: 8 June 2018

Please cite this article as: D. Fancourt, A. Steptoe, Physical and psychosocial factors in the prevention of chronic pain in older age, Journal of Pain (2018), doi: 10.1016/j.jpain.2018.06.001

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Highlights

- Chronic pain is recognised as a major public health challenge as people age.
- We need to identify specific multimodal activities that could reduce the incidence of chronic pain.
- Engaging in vigorous weekly activity is protective against chronic pain in adults aged 50+.
- Cultural engagement (going to museums/galleries/concerts) is protective too.
- Moderate weekly activity and community group participation are not protective.
Physical and psychosocial factors in the prevention of chronic pain in older age

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Disclosures

The English Longitudinal Study of Ageing was developed by a team of researchers based at the University College London, NatCen Social Research, the Institute for Fiscal Studies, and the University of Manchester. The data were collected by NatCen Social Research. The funding is provided by National Institute of Aging Grant R01AG017644 and a consortium of UK government departments coordinated by the Economic and Social Research Council. D.F. is supported by the Wellcome Trust [205407/Z/16/Z]. Both authors declare no conflicts of interest
Abstract

Chronic pain is recognised as a major challenge as people age. Yet, despite growing research on chronic pain management, there is little research into chronic pain prevention. So there is a clear need to identify multimodal activities that could be encouraged amongst older adults as part of a healthy lifestyle to reduce the incidence risk of chronic pain. Using data from the English Longitudinal Study of Ageing we tracked 2,631 adults aged 50+ who were free from chronic pain at baseline across a decade and explore whether physical or psychosocial factors reduced the risk of developing chronic pain. In relation to physical factors, engaging in vigorous weekly activity was protective against the development of chronic pain (OR=0.74, SE=0.07, CI=0.62 to 0.89) when controlling for all identified socio-economic, health and social confounders. But no effects were found for moderate weekly activity. In relation to psychosocial factors, cultural engagement was also protective against the development of chronic pain (OR=0.75, SE=0.07, CI=0.63 to 0.91), but community group participation was not. These findings extend previous work showing that physical activity and psychosocial factors such as positive affect are key factors in the long-term success of chronic pain self-management. Future interventional studies for chronic pain are encouraged.

Perspective

This article explores whether physical and psychosocial activities could reduce the risk of developing chronic pain in older age. These results could potentially help clinicians to recommend multimodal activities as part of a broader healthy lifestyle for those aged 50+ to reduce the incidence rate of chronic pain.

Keywords

Chronic pain; physical activity; psychosocial; community; positive affect
Introduction

Chronic pain is recognised as a major challenge as people age. Prevalence figures vary but broadly suggest that around half to two-thirds of adults aged 50+ are affected (more than four times the number of 18-25 years affected), and incidence rates are as high as 5.4% per year. Pain is one of the most widely cited symptoms of underlying disability in older adults and is linked with impaired physical capacity for basic and instrumental activities of daily living, poorer mobility and falls. Pain is also associated with psychological outcomes, including fatigue, poor quality of life and heightened risk of depression. And it is linked with high economic costs through early retirement, medication, social care needs and health service utilisation. As a result, it is important to identify ways of reducing the risk of developing chronic pain. However, to date, there has been little research into this. A 2016 systematic review identified 9 published reports on physical activity for the prevention of chronic pain. Physical activity has been found to reduce the incidence of chronic low back pain in 7 of these, with data suggesting that intensive programmes are required for effects to emerge. However, these studies have involved relatively small sample sizes (only 3 with a sample size greater than 100) and a range of ages so do not provide a clear picture about strategies for reduction of chronic pain incidence in older adults, when it is most common. Relatedly, having a high BMI is a predictor of chronic pain, and a sedentary lifestyle has been proposed as another predictor. However, other studies have reported no significant associations between physical activity and chronic pain incidence, so our understanding of physical activity as a potential risk-reducing factor for chronic pain remains under-developed. Alongside physical predictors, there is increasing recognition of psychosocial factors in chronic pain. As well as being an outcome of chronic pain, affective factors such as depression also predict future pain, as do anxiety disorders, stress, negative thoughts, neuroticism and catastrophizing. Broader social factors such as low perceived social acceptance and poor social relations have also been identified as predictors. And there is evidence to suggest that cognitive interpretation of pain is key to its perception and classification as ‘chronic pain’, with high levels of self-efficacy and coping resources appearing to be protective.

Consequently, it appears that combinations of physical and psychosocial factors could be protective against the development of chronic pain in older age. But there is still a clear need to identify specific multimodal activities that could be encouraged as part of a broader healthy lifestyle. This multimodal approach is recognised and practised within chronic pain management but less researched in chronic pain prevention. Therefore this paper explored longitudinal associations between physical and psychosocial activities and chronic pain incidence in older age, among individuals initially free of chronic pain. For physical activities, we focused on both moderate and vigorous physical activity in order to ascertain whether there are specific benefits independent of the avoidance of a sedentary lifestyle. For psychosocial activities, a conceptual model for the relationship between positive affect and chronic pain has been proposed, which posits that positive affect and related emotional responses elicited through engagement in stimulating and novel
experiences can buffer perceptions of pain, buffer the effect of pain on physical function, increase daily positive interpersonal events that themselves buffer perceptions of daily pain, foster mindfulness as a means of disengaging from cognitive fixation on pain, broaden the scope of attention to encompass non-painful stimuli, and support positive reappraisal and adaptive coping. These factors are not only helpful for the management of chronic pain but can also stop initial pain from developing into a chronic problem, thereby playing a role in its prevention. There is increasing research focusing on the health and wellbeing benefits of psychosocial activities such as participation in community groups and cultural engagement, so we focused on these two psychosocial activities in order to ascertain whether they are protective against the development of chronic pain.

Methods

Participants

We used data from the longitudinal cohort study the English Longitudinal Study of Ageing (ELSA). ELSA contains a representative sample of adults aged 50+ living in England (18). We specifically worked with data from Wave 2 (2004/05) across every biennial wave through to Wave 7 (2014/2015); a total of 6 waves and a decade of data. The study received ethical approval from the National Research Ethics Service and all participants provided informed consent.

Measures

We measured pain using participant self-report using the questions “Are you often troubled with pain?” and if so, “How bad is the pain most of the time?” (with options of mild, moderate or severe). In line with previous research, we specifically focused on pain that was classed as moderate or severe, and an index was created of whether participants reported such pain at any point across the 10 years (our ‘chronic pain incidence’ index). Participants were additionally asked to specify where they felt their pain occurred: ‘all over’ vs a specific common site (back, hips or knees) vs ‘other’.

Our exposures were all measured at baseline (wave 2). Specifically, we measured two types of physical activity: the frequency with which participants took part in “sports or activities that are moderately energetic” or “vigorous” (hardly ever or never, one to three times a month, once a week, more than once a week). Due to marked skew across these two variables (negative skew for moderate activity and positive skew for vigorous activity), responses were dichotomised into once a week or more vs less frequently. We measured two types of psychosocial activities: frequency of engagement with community groups (including political parties, trade unions, environmental groups, tenants/residents associations, Neighbourhood Watch, church or religious groups, charitable associations, evening classes, social clubs, sports clubs, exercise classes or other clubs/societies) and frequency of engagement with cultural activities (including
going to museums, art galleries, exhibitions, concerts, the theatre or the opera). Both psychosocial activities were dichotomised into every other month or more vs less frequently.

Factors identified as predicting both physical and psychosocial engagement and chronic pain incidence were included as covariates used in the analysis: age (in years), gender (male or female), ethnicity (white British vs other), educational qualifications (no educational qualifications; O-levels; A-levels; degree/higher or equivalent), total non-pension wealth (quintiles) (22), living with a spouse or partner (rather than alone), employment status (working full time vs working part time vs not working), presence of a longstanding physical illness (including cancer, COPD, diabetes, angina or a stroke in the last 2 years), whether participants had arthritis, frequency of alcohol consumption (1-2 days a week, 3-4 days a week, 5-6 days a week or daily), whether participants currently smoked, depression (using the Centre for Epidemiological Studies Depression (CES-D) scale), whether participants had experienced restless sleep in the past week, whether participants were sedentary (doing mild activity less than twice a week) and whether participants were socially isolated (meeting, telephone or emailing family or friends less than once a week).

Statistical analysis

A total of 3,470 participants provided data across all waves for exposure and outcome variables. A total of 112 (3.1%) participants provided incomplete data on covariates so were excluded from analyses (ethnicity=1, employment=24, wealth=47, depression=3, alcohol consumption=34). We further excluded 3 participants who were registered as blind providing a final sample size of 3,358. Due to the possibility of left-censoring, whereby participants could enter the study having had chronic pain for many years and have different profiles of physical and psychosocial activities, we excluded all participants with chronic pain at baseline (n=727).

We used one-way analyses of variance and Chi-Square tests to explore demographic differences between those who did and did not report chronic pain across the decade. We then used logistic and Poisson regression analyses to calculate the odds ratio (OR) and incidence risk ratio (IRR) respectively of developing chronic pain depending on our physical and psychosocial exposures. Our analyses adjusted for all identified confounders (age, gender, ethnicity, educational qualifications, wealth, cohabitation, employment, physical illnesses, arthritis, alcohol consumption, depression, sedentary behaviours and social isolation). We also carried out three sets of sensitivity analyses. First, in order to ascertain whether reported chronic pain was indeed chronic rather than of a limited duration, we calculated the number of occasions across the biennial waves of data collection on which participants reported chronic pain, and re-ran analyses only counting pain as ‘chronic’ if it was reported across two or more waves, as per previous protocols 35. Second, we explored whether there were differences depending on whether participants reported pain at specific sites (back, hips or knees) or ‘all over’ generalised pain by rerunning the analyses with ‘specific chronic pain’ and ‘generalised chronic pain’ as the outcome measure. Third, we carried out two sensitivity analyses to guard
against the possibility of reverse causation. We explored re-ran our analyses excluding people who experienced even mild pain at baseline (n=1,114), in case this mild pain was a precursor to more severe pain and was already affecting their participation in activities. And we also re-ran our analyses excluding people who developed chronic pain in the first wave following baseline (n=348), and those who had pre-existing chronic conditions (n=213) or arthritis (n=910) at baseline in case physical challenges preceding the development of pain were affecting activity engagement. Finally, we re-ran our analyses including mild pain in our definition of chronic pain. This reduced the sample size who were pain free at baseline to 2,244 and led to a 54.2% incidence rate across the 10 years.

All regression assumptions were met. We weighted all data using baseline cross-sectional weights derived from ELSA to ensure the sample was representative of the English population and to account for differential non-response across the following 10 years based on demographic predictors. All analyses were carried out using STATA version 14.

Results

Demographic characteristics

Our sample consisted of 53.4% women, with an average age of 63.0 years (SD=7.7) at baseline, rising to 72.5 years (SD=7.0) 10 years later. Participants were predominantly white (99.1%) and 74.5% were cohabiting with a partner. 36.6% worked part-time or full-time. 4.6% of participants reported one or more chronic conditions, while 18.2% reported having arthritis. 8.7% also showed above-threshold symptoms of depression.

At baseline, 88.3% of participants reported doing moderate activities or sports on a weekly basis or more, while 39.1% reported doing weekly vigorous activities or sports. 37.7% reported engaging with culture every few months or more, while 23.0% reported taking part in community groups.

Across the 10 years, 1,119 participants (42.5%) experienced moderate-severe chronic pain, and for 587 participants (22.3%) this moderate-severe chronic pain was experienced on two or more waves. 895 (34.0%) reported localised pain in one or more of the back, hips, knees or feet, while just 62 participants (5.5%) reported their pain to be ‘all over’, and the remaining classed their pain as ‘other’.

Women were more likely to report chronic pain over the decade, as were those who were not cohabiting with a partner, those with lower educational attainment, lower wealth, those who no longer worked, those with a chronic health condition, those with arthritis, those with depression, those experiencing restless sleep, those who consumed less alcohol, and those who met up socially more often. Notably, there were no
significant differences between levels of sedentary behaviours or smoking behaviours and chronic pain incidence (see Table 1).

### TABLE 1 ABOUT HERE

**Table 1: Participant demographics at baseline split by whether participants developed chronic pain over the following 10 years**

**Physical and psychosocial engagement and pain incidence**

In terms of physical factors, engaging in vigorous weekly activity was protective against the development of chronic pain across a decade (OR=0.74, SE=0.07, CI=0.62 to 0.89). But no effects were found for moderate weekly activity. Of the psychosocial factors, cultural engagement was also protective against the development of chronic pain (OR=0.75, SE=0.07, CI=0.63 to 0.91) after adjustment for all covariates. But no effects were found for community group participation (see Figure 1A).

**Sensitivity analyses**

Our first sensitivity analysis tested whether the pain was indeed chronic through re-analysing the data looking for chronic pain reporting on 2 or more waves. Our results were unchanged: in terms of physical factors, engaging in vigorous weekly activity was protective against the development of chronic pain across a decade (OR=0.73, SE=0.08, CI=0.58 to 0.91). But no effects were found for moderate weekly activity. Cultural engagement was also protective against the development of chronic pain (OR=0.74, SE=0.09, CI=0.59 to 0.93). But no effects were found for community group participation (see Figure 1B).

Our second sensitivity analysis explored whether there were differences depending on whether participants reported localised or generalised pain. For localised pain, engaging in vigorous weekly activity was associated with reduced risk (OR=0.73, SE=0.07, CI=0.61 to 0.88), while no effects were found for moderate weekly activity. Cultural engagement was also protective (OR=0.82, SE=0.08, CI=0.68 to 0.999), with no effects for community group participation (see Figure 1C). For all-over generalised pain, neither moderate nor vigorous activity was associated with a reduced risk of pain incidence (although it should be noted that only 62 participants reported generalised chronic pain over the decade). However, cultural
engagement was associated with a reduced risk (IRR=0.50, SE=0.15, CI=0.27 to 0.90). Community group participation was not significant (IRR=0.58, SE=0.18, CI=0.31 to 1.08) (see Figure 1D).

Our third sensitivity analyses exploring the possibility of reverse causation did not materially affect results. When excluding participants with mild pain at baseline, engaging in vigorous weekly activity was associated with reduced risk of pain (OR=0.70, SE=0.07, CI=0.57 to 0.85), while no effects were found for moderate weekly activity. And cultural engagement was also protective (OR=0.78, SE=0.08, CI=0.64 to 0.96), with no effects for community group participation. When excluding participants who developed chronic pain in the first wave following baseline, engaging in vigorous weekly activity was associated with reduced risk (OR=0.75, SE=0.08, CI=0.61 to 0.91), while no effects were found for moderate weekly activity. And cultural engagement was also protective (OR=0.80, SE=0.08, CI=0.65 to 0.98), with no effects for community group participation. Similarly, when excluding participants with either chronic health conditions at baseline or arthritis at baseline, the significance of results was not affected. Finally, when expanding our definition of chronic pain to include incident mild pain, we found the same pattern of results, with just vigorous weekly activity (OR=0.79, SE=0.07, CI=0.66-0.96) and cultural engagement (OR=0.80, SE=0.08, CI=0.65-0.97) associated with a lower risk of developing chronic pain.

**Discussion**

This study is the first to explore simultaneously potential physical and psychosocial protective factors for the development of chronic pain in older adults. Our results demonstrate that both vigorous weekly activity and regular cultural engagement appear to reduce risk of incident chronic moderate-severe pain, recurring chronic pain and site-specific pain. Cultural engagement also appears to be a risk-reducing factor for the development of widespread pain. These associations were found independent of demographic, socio-economic and health-related covariates, as well as sedentary behaviours and social isolation.

Although there are few existing studies on the prevention of chronic pain incidence, our findings echo previous findings and related literature. First, it is notable that vigorous but not moderate physical activity was associated with a lower pain incidence. Previously, intensive physical activity (daily stretching and twice weekly muscle endurance training) has been found to reduce the incidence of low back over 12 months \(^2^8\), but moderate physical activity (daily muscle strength exercises) does not appear to reduce incidence of low back pain in adults over 24 months \(^1^1\). So this study reinforces the suggestion that only vigorous activity is protective against the development of chronic pain. However, it is notable that both previous studies have been with working age adults rather than older adults and are therefore not directly comparable. Older adults may have greater endogenous pain facilitation and a reduced capacity to endogenously inhibit pain, which increases their risk of chronic pain \(^2^2\). Therefore older adults need to be studied separately from younger adults. In considering why vigorous activity was found to be a risk-
reducing factor for chronic pain in this study, there are several hypotheses. First, chronic low-grade systemic inflammation and oxidative stress become more common as adults age, both of which have been demonstrated to induce sensitisation of pain pathways. Vigorous physical activity has been found to have anti-inflammatory and antioxidant effects that could reduce this sensitisation. Second, vigorous physical activity may be associated with lower temporal summation of pain in older adults; a finding not seen for lighter physical activity. Temporal summation is often used as an indirect marker of central sensitisation to pain. Therefore, regular vigorous (but not moderate) physical activity may be protective against the development of chronic pain in older age.

This study also found evidence that psychosocial factors may be protective against the development of chronic pain, in particular engagement in cultural activities such as going to museums, art galleries, exhibitions, concerts, the theatre or the opera. It is notable that the odds ratios for cultural engagement were directly comparable with those of vigorous physical activity, suggesting a reduction of 25-26% in risk of chronic pain incidence. In considering why these effects emerged, cultural engagement is a multimodal activity, comprising of social engagement, gentle physical activity and positive affect responses. In this study, benefits of cultural engagement were found independent of sedentary behaviours, physical activity and social isolation, suggesting that these components in themselves are not responsible for the associations noted. However, other studies have identified psychological benefits of cultural engagement, including the enhancement of wellbeing, the prevention of the development of depression and the recovery from mental illness. Notably, these positive psychological benefits have not been found consistently for community group membership, which could explain the differences in association with chronic pain found in this study. Indeed, it is notable that for participants who experienced widespread pain, only psychosocial factors, not physical factors, were found to be risk-reducing. Patients with widespread pain typically report high levels of stress, anxiety and depression and the condition is often comorbid with psychiatric disorders. As a result, psychosocial activities may be particularly effective for these patients.

As this study is observational rather than experimental, causality cannot be assumed. However, we used a large and nationally-representative sample of older adults in England, tracked reports of pain over a decade, and controlled for all identified confounding variables. While it is possible that latent confounding factors may explain our results, it is notable that we found results for some but not all factors (such as vigorous but not moderate physical activity). In noting that this sample was nationally-representative for Britain, it is relevant that the sample was largely White British and as such whether the results can be generalised to different ethnicities remains unknown. Finally, our outcome measure was self-report rather than based on an objective physical test, and the interview asked participants if they were ‘often’ troubled.
by pain, rather than giving a specific timeframe to consider. However, we tested our definition of ‘chronic pain’ through a series of sensitivity of analyses, which confirmed our initial findings.

In conclusion, this study supports previous work suggesting that vigorous (but not moderate) physical activity can be protective against the development of chronic pain in older age, and showed for the first time that cultural engagement could be a protective psychosocial factor. These findings extend previous work showing that patient motivation, coping self-efficacy and positive affect are key factors in the long-term success of chronic pain self-management \(^{13}\), to suggest that such factors could also be encouraged through psychosocial interventions such as cultural engagement to reduce chronic pain incidence, especially in those with widespread pain. This study has implications for clinicians working with chronic pain patients as it suggests that vigorous physical activity can be recommended to help prevent chronic pain; a recommendation that ties in with other well-known health benefits of physical activity. And it also suggests that schemes such as social prescribing could be of value to help prevent the development of chronic pain.
REFERENCES

1. Arnstein P: Multimodal approaches to pain management: Nursing (Lond) 41:60–1, 2011.


Table 1: Participant demographics at baseline split by whether participants developed chronic pain over the following 10 years

<table>
<thead>
<tr>
<th></th>
<th>Participants who do not develop chronic pain (n=1,512)</th>
<th>Participants who develop chronic pain (n=1,119)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean ± SD)</td>
<td>62.6 ± 7.6</td>
<td>63.5 ± 7.8</td>
<td>.004*</td>
</tr>
<tr>
<td>Female, %</td>
<td>48.4%</td>
<td>60.1%</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>White, %</td>
<td>98.9%</td>
<td>99.3%</td>
<td>.29</td>
</tr>
<tr>
<td>Married/cohabiting, %</td>
<td>77.2%</td>
<td>70.9%</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Educational attainment, %</td>
<td></td>
<td></td>
<td>&lt;.001</td>
</tr>
<tr>
<td>No qualifications</td>
<td>22.0%</td>
<td>33.5%</td>
<td></td>
</tr>
<tr>
<td>O-level/GCSE</td>
<td>22.5%</td>
<td>20.9%</td>
<td></td>
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<tr>
<td>A-level</td>
<td>32.9%</td>
<td>31.6%</td>
<td></td>
</tr>
<tr>
<td>Degree</td>
<td>22.6%</td>
<td>13.9%</td>
<td></td>
</tr>
<tr>
<td>Employment, %</td>
<td></td>
<td></td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Not working</td>
<td>48.7%</td>
<td>59.8%</td>
<td></td>
</tr>
<tr>
<td>Working part time</td>
<td>20.6%</td>
<td>17.7%</td>
<td></td>
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<tr>
<td>Working full time</td>
<td>30.7%</td>
<td>22.5%</td>
<td></td>
</tr>
<tr>
<td>Wealth quintiles, %</td>
<td></td>
<td></td>
<td>&lt;.001</td>
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<tr>
<td>1 (lowest)</td>
<td>13.1%</td>
<td>20.1%</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>17.6%</td>
<td>21.1%</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>21.0%</td>
<td>20.6%</td>
<td></td>
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<td>4</td>
<td>22.4%</td>
<td>19.7%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 (highest)</td>
<td></td>
<td>18.5%</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>Existing chronic condition, %</td>
<td>3.6%</td>
<td>6.1%</td>
<td>.003</td>
</tr>
<tr>
<td>Existing arthritis, %</td>
<td>10.0%</td>
<td>29.3%</td>
<td>&lt;.001</td>
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<tr>
<td>Existing depression, %</td>
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<td>12.3%</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Frequency of alcohol intake, %</td>
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<td></td>
</tr>
<tr>
<td>1-2 days a week</td>
<td>16.5%</td>
<td>22.3%</td>
<td></td>
</tr>
<tr>
<td>3-4 days a week</td>
<td>11.7%</td>
<td>11.4%</td>
<td></td>
</tr>
<tr>
<td>5-6 days a week</td>
<td>42.5%</td>
<td>40.7%</td>
<td></td>
</tr>
<tr>
<td>Nearly every day</td>
<td>29.3%</td>
<td>25.6%</td>
<td></td>
</tr>
<tr>
<td>Current smoker, %</td>
<td>11.1%</td>
<td>11.2%</td>
<td>.96</td>
</tr>
<tr>
<td>Experiencing restless sleep, %</td>
<td>29.4%</td>
<td>42.9%</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Sedentary lifestyle (mild activity &lt;twice weekly)</td>
<td>15.3%</td>
<td>13.8%</td>
<td>.26</td>
</tr>
<tr>
<td>Socially isolated (social contact &lt;once a week)</td>
<td>25.7%</td>
<td>21.0%</td>
<td>.005</td>
</tr>
</tbody>
</table>

Notes: All tests show Chi-Square test results, with the exception of * which used a one-way ANOVA.