Chronic widespread pain predicts physical inactivity: Results from the prospective EPIFUND study

John McBeth a,*, Barbara I. Nicholl a,1, Lis Cordingley b, Kelly A. Davies a, Gary J. Macfarlane c

aArthritis Research Campaign (ARC) Epidemiology Unit, School of Translational Medicine, Staphord Building, University of Manchester, Oxford Road, Manchester M13 9PT, United Kingdom
bEpidemiology Research Group, School of Translational Medicine, Stopford Building, University of Manchester, Oxford Road, Manchester M13 9PT, United Kingdom
cAberdeen Pain Research Collaboration (Epidemiology Group), University of Aberdeen, School of Medicine, Polwarth Building, Foresterhill, Aberdeen AB25 2ZD, United Kingdom

A R T I C L E  I N F O

Article history:
Received 28 October 2009
Received in revised form 8 March 2010
Accepted 8 March 2010
Available online 18 April 2010

Keywords:
Chronic widespread pain
Physical activity
Psychosocial
Population-based
Prospective

A B S T R A C T

This study tested the hypothesis that chronic widespread pain (CWP) would predict low levels of physical activity (PA). Pain status and PA levels were ascertained at baseline and 32 months in community subjects. Three PA questions were used: “in comparison with others your own age, is your PA “the same” (referent), “more-much more” or “less-much less””, and “during the past month on average how many days/week have you taken exercise that has (i) lasted at least 20 min? and (ii) made you sweat?: “4–7” (referent), “1–3” or “none””. Multinomial logistic regression models quantified the relationship between baseline CWP and PA at follow-up (relative risk ratios (RRR) (95% confidence intervals)). Two thousands one hundred and eighty-two subjects participated and provided complete pain and PA information at both timepoints. CWP was reported by 18% (n = 429) of participants at baseline. Compared to subjects who were free of CWP at baseline, those with CWP had an increased odds of reporting “less-much less” PA at follow-up (RRR = 4.5 (3.2–6.2)). This relationship remained after adjustment for confounders (RRR = 1.9 (1.3–2.9)). A similar association was observed with exercise that lasted at least 20 min (RRR = 1.9 (1.3–2.8)). The current study suggests that low self-reported levels of physical activity are a consequence of having CWP.

© 2010 European Federation of International Association for the Study of Pain Chapters. Published by Elsevier Ltd. All rights reserved.

1. Introduction

Individuals with fibromyalgia, a common disorder characterised by chronic widespread pain (CWP), widespread tenderness and additional physical and psychological symptoms (Wolfe et al., 1990) have been shown to be sedentary (Busch et al., 2008) to have low levels of physical functioning (Jones et al., 2008) and compromised cardiorespiratory fitness (Busch et al., 2008). These studies have examined the cross-sectional relationship between CWP and/or fibromyalgia. Whether CWP is associated with a consequent decrease in physical activity is not known. Nevertheless, the complex presentation of the disorder requires a multidisciplinary approach to treatment (Arnold et al., 2008) with an increase in levels of physical activity generally recommended. The role of low levels of physical activity in the aetiology of CWP and fibromyalgia is unclear and it has been recommended that the aim of treatment of fibromyalgia should be to target secondary symptoms (general fitness, emotional well being) rather than the pain per se. A recent review of randomised clinical trials of physical activity for the treatment of fibromyalgia (Karmisholt and Gotzsche, 2005) reported that of four “high quality” trials none reported an improvement in pain although improvements in cardiovascular fitness and health related quality of life were noted. A meta-analysis of six studies confirmed the improvement in cardiovascular fitness and suggested a positive effect on pain and tender points (Busch et al., 2008).

We have previously reported, from a population-based study, that subjects who reported CWP had an increased mortality risk (Macfarlane et al., 2001; McBeth et al., 2003). The increased risk was primarily associated with deaths from cancer. We have replicated the finding with cancer and reported an increased risk of death associated with cardiovascular disease (McBeth et al., 2009). Other studies have reported no association (Macfarlane et al., 2007; Smith et al., 2003). If the relationship is true, one possible mechanism of association is through reduced levels of physical activity. It is plausible to hypothesise that individuals with CWP are more likely to report reduced levels of physical activity. Reduced levels of physical activity are associated with an increased...
risk of breast (Rockhill et al., 1999) and prostate (Thune and Lund, 1996) cancer, the two cancers increased in our previous work, and with cardiovascular disease (Prasad and Das, 2009). The aim of the current study was to test the hypothesis that CWP would predict lower physical activity levels when compared to pain free subjects and that these relationships would be independent of putative confounding psychological factors.

2. Materials and methods

2.1. Study design

The EPIFUND (epidemiology of functional disorders) study was a prospective population based cohort study. All subjects were contacted by post and asked to complete a questionnaire that included a detailed assessment of current pain status and physical activity levels. The questionnaire also included an assessment of psychological state and illness behaviour. Subjects who provided full baseline information on pain status, physical activity and putative confounders were followed up 32 months later and asked again about their pain status and physical activity levels.

2.2. Study subjects

Subjects, aged 25–65 years, were randomly recruited from the general practice registers of three areas in the northwest of England. The areas represented three diverse socio-economic areas (median (95% CI) Townsend scores (Townsend et al., 1988) were −3.6 (−3.8, −3.6), 0.7 (0.2, 1.2), and 3.8 (3.6, 3.8)). The study had received full ethical approval from the Local Research Ethics Committees and the Research Ethics Committee of The University of Manchester.

2.3. Assessment of baseline pain status

Subjects were asked whether they had experienced pain lasting for one day or longer in the past month. If their response was positive subjects were asked to indicate the location(s) of their pain, by shading on blank body manikins (front, back, left and right sides). In addition subjects were asked whether they had been aware of their pain for 3 months or longer. Subjects were classified into one of three groups based on their pain reports: those reporting no pain were the “no pain” group, those reporting pain that did not satisfy criteria for CWP were classified as “some pain” and those who satisfied the American College of Rheumatology criteria for “CWP” used in their definition of fibromyalgia (pain in contra-lateral body quadrants, above and below the waist, and on the left for “CWP” used in their definition of fibromyalgia (pain in contra-lateral body quadrants, above and below the waist, and on the left...

2.4. Assessment of physical activity levels

Identical methods to assess physical activity levels were used in both the baseline and follow-up questionnaires. Participants were asked to rate three questions addressing different aspects of physical activity:

1. In comparison to others of your own age, do you think your physical activity is?
   - Much more/more/ the same/less/much less.
2. During the past month, on average, on how many days per week have you taken exercise that makes you sweat?
   - Every day/4–6 days/2–3 days/1 day/none.
3. During the past month, on average, on how many days per week have you taken exercise that makes you sweat?
   - Every day/4–6 days/2–3 days/1 day/none.

2.5.Baseline questionnaire

Alongside pain and physical activity information, the baseline questionnaire also gathered data on psychosocial status, using a number of validated scales, and other measures that may act as potential confounders to any association found between pain and subsequent physical activity levels.

2.6. Psychosocial status

2.6.1. General Health Questionnaire (GHQ) (Goldberg and Williams, 1988)

The 12-item version of the GHQ has been used in previous population-based studies of pain to assess levels of psychological distress. Items are answered on a Likert scale of 1–4, which are subsequently dichotomised to 0, for a negative answer, and 1 for a positive, hence giving a score of 0–12, with a higher score indicating greater levels of psychological distress. Items include “in the past few weeks have you felt constantly under strain”.

2.6.2. Hospital Anxiety and Depression Scale (HAD) (Zigmond and Snaith, 1983)

The HAD is a 14-item scale originally designed to assess anxiety and depression in patients with physical illness. It has since been common to find it used in population surveys. All items are scored on a Likert scale of 0–3, the two subscales are scored separately, thus providing a maximum score of 21 for both anxiety and depression. Scores on each subscale of 10–11 represent a high probability of an anxiety or depression disorder being present.

2.6.3. Threatening life events (Brugha et al., 1985)

This is a 12-item scale adapted from Tennant and Andrews (1976) 67-item life events inventory (Tennant and Andrews, 1976). It gathers information on 12 events, including death of a spouse, financial crisis, court appearance and marital difficulties, which are thought to reflect a significant contextual threat. The inventory is scored as the number of events experienced during the past 6 months.

2.7. Other potential confounding factors

To adjust for area level deprivation we used study area as a proxy variable with subjects in the relatively affluent area (Townsend score = −3.6) classified as the referent group. Subjects’ marital status was classified as single, married/co-habiting, separated/divorced, or widowed. Employment status was grouped into three categories: working, not working due to ill health, and other. “Other” represented subjects who classified themselves as unemployed but seeking work, a student, semi-retired or retired.

Information on alcohol consumption and smoking history were collected. For the purposes of this analysis, having ever smoked cigarettes regularly for a period of 1 month or longer and having ever drank alcohol regularly for one month or longer was used.

2.8. Statistical analysis

Subjects who provided complete physical activity and pain data at follow-up formed the cohort for this analysis. The three physical activity questions at follow-up were the three outcomes of interest in the analysis. For analysis responses to the question “In comparison to others your own age do you think your physical activity is?” were collapsed into “more/much more” and “less/much less” with the same classified as the referent category. Responses to the other questions were classified as “none”, “1–3 days” with “4–7 days classified as the referent category. Multinomial logistic regression models were used to quantify the relationship between...
baseline pain status and subsequent physical activity levels 32 months later. All models were adjusted for age and gender. In order to assess the importance of potential baseline confounders measured, each was added into the models individually and a likelihood ratio test conducted and variables making a significant contribution to the model retained. This method of modelling has been suggested as an alternative to forward stepwise regression in which the software is in control of the data (Henderson and Vellman, 1981). Each of the three models was then adjusted for the same baseline physical activity question. Results are presented as Relative risk ratios (RRR) and 95% confidence intervals (95% CI). Finally, to take account of those subjects who did not respond to the follow-up questionnaires, i.e. non-response, age–sex stratum specific sampling probability weights were applied to each subject and “weighted” multinomial logistic models were fitted. All statistical analyses were carried out using STATA version 9 (STATA, 2003).

3. Results

A total of 4899 subjects were mailed a baseline questionnaire of who 3985 (81.3%) returned a questionnaire (Fig. 1). However of those who responded 670 subjects did not provide complete data

![Flowchart of baseline and follow-up participation.](image-url)
Table 1
Comparison of subject characteristics by follow-up physical activity levels.

| Category                  | Physical activity levels at follow-up | During the past month, on average, how many days per week have you taken exercise that lasts at least 20 min? | During the past month on average on how many days per week have you taken exercise that has made you sweat? |
|---------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
|                           |                                      | 4–7 days | 1–3 days | None | P-value<sup>a</sup> | 4–7 days | 1–3 days | None | P-value<sup>a</sup> |
|                           |                                      | n (%)    | n (%)    | n (%) |                  | n (%)    | n (%)    | n (%) |                  |
| Baseline pain status      |                                      |         |         |       |                  |         |         |       |                  |
| No pain                   |                                      | 357 (39.2) | 455 (50.0) | 99 (10.8) | <0.01 | 433 (47.5) | 352 (38.7) | 126 (13.8) | <0.01 | 219 (24.1) | 434 (47.6) | 258 (28.3) | <0.01 |
| Some pain                 |                                      | 360 (40.5) | 359 (40.4) | 170 (19.1) |       | 381 (42.9) | 330 (37.1) | 178 (20.0) | <0.01 | 181 (20.4) | 388 (43.6) | 320 (36.0) | <0.01 |
| CWP                       |                                      | 118 (30.9) | 119 (31.1) | 145 (38.0) |       | 141 (36.9) | 132 (34.6) | 109 (28.5) |       | 77 (20.2) | 144 (37.7) | 161 (42.1) |       |
| Gender                    |                                      |         |         |       |                  |         |         |       |                  |
| Male                      |                                      | 302 (33.5) | 434 (48.2) | 165 (18.3) | <0.01 | 394 (43.7) | 345 (38.3) | 162 (18.0) | 0.57  | 210 (22.3) | 435 (48.3) | 256 (28.4) | <0.01 |
| Female                    |                                      | 533 (41.6) | 499 (39.0) | 249 (19.4) |       | 561 (43.3) | 469 (36.6) | 251 (19.6) |       | 267 (20.8) | 531 (41.5) | 483 (37.7) |       |
| Age (median (95% CI))     |                                      | 48.5 (47.2–49.3) | 51.1 (50.0–52.2) | 48.8 (47.0–50.2) | <0.01 | 50.9 (49.8–51.9) | 47.8 (47.0–51.1) | 50.0 (49.0–51.1) | <0.01 | 48.6 (47.2–50.2) | 48.6 (47.4–50.2) | 51.5 (50.4–52.8) | <0.01 |
| Marital Status            |                                      |         |         |       |                  |         |         |       |                  |
| Single                    |                                      | 89 (41.0) | 74 (34.1) | 54 (24.9) | <0.01 | 94 (43.3) | 78 (36.0) | 45 (20.7) | 0.03  | 48 (22.1) | 95 (43.8) | 74 (34.1) | 0.01  |
| Married/co-habiting       |                                      | 646 (39.0) | 730 (44.1) | 281 (16.9) |       | 741 (44.7) | 626 (37.8) | 290 (17.5) |       | 369 (22.3) | 758 (45.7) | 530 (32.0) |       |
| Separated/divorced        |                                      | 64 (29.0) | 95 (43.0) | 62 (28.0) |       | 81 (36.7) | 79 (35.7) | 61 (27.6) |       | 44 (19.9) | 81 (36.7) | 96 (43.4) |       |
| Widowed                   |                                      | 36 (41.4) | 34 (39.1) | 17 (19.5) |       | 39 (44.8) | 31 (35.6) | 17 (19.6) |       | 16 (18.4) | 32 (36.8) | 39 (44.8) |       |
| Employment status         |                                      |         |         |       |                  |         |         |       |                  |
| Working                   |                                      | 621 (41.4) | 663 (44.1) | 218 (14.5) | <0.01 | 629 (41.9) | 595 (39.6) | 278 (18.5) | <0.01 | 343 (22.8) | 688 (45.8) | 471 (31.4) | <0.01 |
| Not working due to ill health |                                  | 22 (16.8) | 18 (13.7) | 91 (69.5) |       | 40 (30.5) | 36 (27.5) | 55 (42.0) |       | 17 (13.0) | 38 (29.0) | 76 (58.0) |       |
| Other                     |                                      | 192 (35.0) | 252 (45.9) | 105 (19.1) |       | 286 (52.1) | 183 (33.3) | 80 (14.6) |       | 117 (21.3) | 240 (43.7) | 192 (35.0) |       |
| Ever drank regularly for >1 month? |                            |         |         |       |                  |         |         |       |                  |
| No                        |                                      | 193 (41.8) | 151 (32.7) | 118 (25.5) | <0.01 | 203 (43.9) | 145 (31.4) | 114 (24.7) | <0.01 | 89 (19.3) | 165 (35.7) | 208 (45.0) | <0.01 |
| Yes                       |                                      | 642 (37.3) | 782 (45.5) | 296 (17.2) |       | 752 (43.7) | 669 (38.9) | 299 (17.4) |       | 388 (22.5) | 801 (46.6) | 531 (30.9) |       |
| Ever smoked for >1 month? |                                      |         |         |       |                  |         |         |       |                  |
| No                        |                                      | 461 (39.5) | 525 (45.0) | 181 (15.5) | <0.01 | 532 (45.6) | 470 (40.3) | 165 (14.1) | <0.01 | 261 (22.4) | 559 (47.9) | 347 (29.7) | <0.01 |
| Yes                       |                                      | 374 (36.8) | 408 (40.2) | 233 (23.0) |       | 423 (41.7) | 344 (33.9) | 248 (24.4) |       | 216 (21.3) | 407 (40.1) | 392 (38.6) |       |
| Psychosocial scales        |                                      |         |         |       |                  |         |         |       |                  |
| GHQ                       |                                      | 0 (0–0) | 0 (0–0) | 1 (1–2) | <0.01 | 0 (0–0) | 0 (0–0) | 1 (0–1) | <0.01 | 0 (0–0) | 0 (0–0) | 0 (0–1) | <0.01 |
| HAD anxiety               |                                      | 5 (4–5) | 4 (4–5) | 6 (6–6) | <0.01 | 5 (4–5) | 5 (4–5) | 5 (5–6) | <0.01 | 5 (4–5) | 5 (4–5) | 5 (5–6) | 0.01  |
| HAD depression            |                                      | 2 (2–3) | 2 (2–2) | 5 (4–6) | <0.01 | 2 (2–2) | 2 (2–3) | 4 (3–5) | <0.01 | 2 (2–3) | 2 (2–2) | 3 (3–4) | <0.01 |
| Life events               |                                      | 0 (0–1) | 0 (0–1) | 1 (1–1) | <0.01 | 1 (0–1) | 1 (0–1) | 1 (0–1) | 0.29  | 1 (0–1) | 0 (0–1) | 1 (0–1) | 0.02  |

<sup>a</sup> By Chi-squared test.
<sup>b</sup> By Kruskall Wallis test.
<sup>c</sup> Measured at follow-up.
and were removed from the dataset, leaving 3315 (67.7% of the original mailed sample) for analysis. When compared to those who participated and provided full data (1) nonresponders were younger and from a more affluent area and (2) those that returned a questionnaire but had missing data did not significantly differ with respect to age, gender or area of residence. A total of 2893 were mailed a follow-up questionnaire (after removing from the study the 24 who had requested no further contact, 389 subjects who had moved and the nine who had died in the interim period) (Fig. 1). Of those 2387 returned a questionnaire and 2182 provided full data that could be used in the current analysis. This provided a participation rate of 75.4% of those subjects who were mailed a follow-up questionnaire.

### Table 2
Impact of baseline pain on self-reported physical activity levels at follow-up.

| Adjustments                        | Baseline pain status | In comparison to others your own age do you think your physical activity is | During the past month, on average, how many days per week have you taken exercise that lasts at least 20 min? | During the past month on average on how many days per week have you taken exercise that has made you sweat? |
|------------------------------------|----------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
|                                    |                      | More-much more | Less-much less | RRR (95% CI) | More-much more | Less-much less | RRR (95% CI) | RRR (95% CI) | RRR (95% CI) |
| Age and gender                      | No pain              | Referent        | Referent        | Referent     | Referent     | Referent     | Referent     | Referent     | Referent     |
|                                    | Some pain            | 0.8 (0.6–0.9)   | 1.7 (1.3–2.3)   | 1.1 (0.9–1.3) | 1.6 (1.2–2.1) | 1.1 (0.9–1.4) | 1.4 (1.1–1.9) |               |
|                                    | CWP                  | 0.8 (0.6–1.02)  | 4.5 (3.2–6.2)   | 1.2 (0.9–1.6) | 2.7 (1.9–3.7) |               |               |               |
| + Putative confounders              | No pain              | Referent        | Referent        | Referent     | Referent     | Referent     | Referent     | Referent     | Referent     |
|                                    | Some pain            | 0.8 (0.6–0.9)   | 1.4 (1.04–1.9)  | 1.1 (0.9–1.4) | 1.4 (1.1–1.9) | 1.1 (0.9–1.4) | 1.3 (0.98–1.7) |               |
|                                    | CWP                  | 0.9 (0.6–1.2)   | 2.5 (1.7–3.5)   | 1.2 (0.9–1.6) | 1.7 (1.2–2.4) | 0.96 (0.7–1.3) | 1.1 (0.8–1.6) |               |
| + Baseline physical activity levels  | No pain              | Referent        | Referent        | Referent     | Referent     | Referent     | Referent     | Referent     | Referent     |
|                                    | Some pain            | 0.8 (0.6–1.01)  | 1.3 (0.97–1.8)  | 1.1 (0.9–1.4) | 1.5 (1.1–2.0) | 1.04 (0.8–1.3) | 1.2 (0.9–1.6) |               |
|                                    | CWP                  | 0.9 (0.6–1.3)   | 1.9 (1.3–2.8)   | 1.2 (0.9–1.7) | 1.7 (1.1–2.6) | 0.95 (0.7–1.3) | 1.0 (0.7–1.5) |               |

---

3.1. Baseline analysis

Of the 2182 participants 911 (41.8%) reported no pain, 889 (40.7%) some pain and 382 (17.5%) satisfied the criteria for CWP at baseline. Subjects with some pain and those with CWP were more likely to be female, older, not be married or co-habiting, not working due to ill health, less likely to consume alcohol but more likely to smoke when compared to those who were pain free (data not shown). Those reporting some pain and CWP also had higher GHQ and HAD scores, reported experiencing more stressful life events in the 6 months prior to completing the study questionnaire and had lower mental and physical quality of life.

---

* Adjusted for age and gender.
* Adjusted for age, gender, area of residence and confounding factors specific to each of the three physical activity models.
* Adjusted for age, gender area of residence and confounding factors specific to each of the three physical activity models, and baseline physical activity levels.
* Depression, smoking history, alcohol consumption, occupation at follow-up.
* Depression, traumatic life events, alcohol consumption, occupation at follow-up.
Having some pain and CWP at baseline was associated with being in the poorest category for all three measures of physical activity at follow-up (less/much less physical activity compared to others your own age, no exercise lasting at least 20 min, and no exercise that has made you sweat) (Table 1). Women were more likely than men to report low levels of activity. Subjects who were separated/divorced and those reporting not working due to ill health were also more likely to report low levels. While regular alcohol use for >1 month was associated with an increased likelihood of physical activity, ever smoking for >1 month was associated with a decreased likelihood.

3.2. Prospective analysis

Compared to those with no pain at baseline, having regional or CWP was associated with an increased likelihood of reporting poorer levels of physical activity at follow-up. As an example we have included a figure that shows stability or movement into the lowest level of activity for all three physical activity variables (see Fig. 2). This shows, for example, that of those with no pain at baseline and who reported less/much less "physical activity in comparison to others your own age", 41% continued to report less/much less at follow-up. Of those with no pain who reported the same or more/much more "physical activity in comparison to others your own age" at baseline 14% and 3% respectively reported less/much less at follow-up. These figures were significantly higher for those with CWP at baseline: 75% continued to report less/much less, while 27% and 5% of those reporting the same or more/much more respectively were in the lowest category at follow-up.

When we examined the relationship between baseline pain status and physical activity levels at follow-up (Table 2) we found that after adjusting for age and gender, compared to subjects with no pain at baseline those with some pain were 70%, and those with CWP over four times more likely to report "less/much less" physical activity in comparison to others their own age. Similarly reporting pain was associated with an increased odds of reporting no days in the past month for exercise lasting at least 20 min or exercise that has made you sweat. The relationships with "less/much less" physical activity in comparison to others their own age and no days in the past month for exercise lasting at least 20 min persisted, albeit attenuated, after adjustment for putative confounders (deprivation, depression, traumatic life events, smoking, alcohol consumption, and occupation). Physical activity levels at follow-up may simply reflect those at baseline. However, after adjustment for baseline levels of physical activity, reporting some pain remained moderately associated while having CWP remained associated with an almost 2-fold increased odds of reporting low levels of activity at follow-up.

Finally we were concerned about the impact non-response may have had on our results and so compared the baseline measures between those who did and did not participate at follow-up (Table 3). Non-participants were younger, had lower levels of physical activity at baseline, less likely to drink alcohol, but more likely to smoke. Non-participants were also more likely to score higher on all psychosocial scales except that assessing the number of recent traumatic life events. To examine the effect of non-participation on our results we conducted a weighted analysis that indicated no effect of non-participation (data not shown).

4. Discussion

In the current study we sought to examine the hypothesis that having CWP would predict low levels of self-reported physical activity. We found that subjects who reported having some pain or CWP had an increased risk of low levels of physical activity 32 months later. Specifically, after adjusting for age, gender, and

Table 3  
Comparison of baseline measures between non-participants and full-participants at follow-up.

| Category | Non-participants\(^a\) n = 711 (24.6%) | Full participants n = 2182 (75.4%) |
|----------|------------------------------------------|----------------------------------|
| Gender   | Male 319 (44.9) 901 (41.3) 0.09          | Female 392 (55.1) 1281 (58.7)   |
| Age (median, 95% CI) | 45.6 (44.5–47.3) 49.5 (48.9–50.2) <0.01 | 45.6 (44.5–47.3) 49.5 (48.9–50.2) <0.01 |
| Baseline CWP status | No pain 263 (37.0) 911 (41.8) 0.11 | Some pain 300 (42.2) 889 (40.7) 0.11 |
| | CWP 148 (20.8) 382 (17.5) | | |
| In comparison to others your own age | The same 282 (39.7) 859 (39.4) <0.01 | More–much more 256 (36.0) 955 (43.8) <0.01 |
| | Less–much less 173 (24.3) 368 (16.9) | | |
| During the past month, on average, how many days per week have you taken exercise that lasts at least 20 min? | No pain 4–7 days 258 (36.3) 927 (42.4) <0.01 | 1–3 days 300 (42.2) 909 (41.7) <0.01 |
| | None 153 (21.5) 346 (15.9) | | |
| Ever drank regularly for >1 month? | No 181 (25.5) 530 (74.5) 0.02 | Yes 530 (74.5) 1720 (78.8) |
| Ever smoked for >1 month? | No 321 (45.2) 1167 (53.5) <0.01 | Yes 390 (54.8) 1015 (46.5) |
| Psychosocial scales | GHQ Median (95% CI) 0 (0–1) | Median (95% CI) 0 (0–1) 0.01 |
| | HAD anxiety 5 (5–6) 5 (5–5) 0.01 | | |
| | HAD depression 3 (3–4) 3 (2–3) <0.01 | | |
| | Life events 1 (0–1) 1 (0–1) 0.33 | | |

\(^a\) Non-participants include subjects who did not respond or who did not provide full data (including participants of the short and telephone questionnaires) at follow-up.

\(^b\) Chi-squared test, except for age and psychosocial scales, which was by Mann-Whitney U test.
Chronic widespread pain is associated with reduced levels of physical activity, possibly via increased levels of fear avoidant behaviour, and with higher levels of psychological distress. These relationships have, in addition to the direct effects of the pain itself, profound physiological effects. For example, via decreased sympathetic tone physical inactivity increases the risk of cardiovascular events while higher levels of psychological distress are associated with increased cortisol production via increased activity of the hypothalamic pituitary adrenal axis which has been shown to be associated with an increased risk of cardiovascular disease. Over time these physiological changes may be associated with the increased rate of morbidity and mortality observed in individuals with chronic widespread pain.

Fig. 3. Hypothesised pathway illustrating route from chronic widespread pain to increased risk of morbidity and mortality.
studies should seek to confirm these findings through objective measures. It may be directly associated with an increased mortality risk. Future studies with pain and offers a plausible mechanism via which pain endurance may in part explain this relationship. Higher levels of physical activity are also associated with a reduction of up to 30% in the risk of breast cancer (Hardman, 2001) although this finding is not consistent. It is colo-rectal and breast cancer that we have previously found to be in excess among subjects who report pain (Macfarlane et al., 2001; McBeth et al., 2003). Although unclear, potential mechanisms of association include systemic influences (e.g. reduced body fat), improved immunosurveillance, improved gut transit time (colon cancer) and decreased exposure to oestrogen (breast cancer). Our previous studies of the long term outcome of CWP have shown strong associations with cancer incidence and subsequent mortality (Macfarlane et al., 2001; McBeth et al., 2003) and with cardiovascular deaths (McBeth et al., 2009). These relationships were independent of factors known to increase the rate of both cancer and cardiovascular disease: age, gender, smoking and socio-economic status. It is plausible to hypothesise that the increased rate of physical inactivity in subjects with CWP may explain the relationship with mortality. Of course there are other pathways through which CWP may influence survival including (see Fig. 3) increasing levels of psychological distress and the consequent physiological changes associated with these increased levels, and the physiological changes associated with pain itself.

To summarise, the current study has shown that individuals in a population-based study of musculoskeletal pain were more likely when compared to those with no pain to report physical inactivity 32 months later. This increased risk of physical inactivity may in turn increase the risk of colo-rectal and breast cancer among subjects with pain and offers a plausible mechanism via which pain may be directly associated with an increased mortality risk. Future studies should seek to confirm these findings through objective measurement of physical activity levels. Current evidence (Busch et al., 2008) suggests that physical activity benefits both symptoms and cardiovascular fitness and so the individual health benefits of recommending increased levels of physical activity among these individuals are clear.

Funding

This study was supported by the Arthritis Research Campaign, Chesterfield, United Kingdom. Grant No. 17552.

Disclosure statement

The authors have no conflicts of interest to declare.

Acknowledgements

The authors would like to thank the doctors, staff and participants at the three general practices for their participation in the study. Thanks also to Joanna Bradley, Karen Schafftheule and Ruth Fullam for data collection and administration.

References

Anderson HL. Increased mortality among individuals with chronic widespread pain relates to lifestyle factors: a prospective population-based study. Disabil Rehabil 2009;31:1980–7.
Arnold LM, Bradley LA, Claus DJ, Glass JM, Goldenberg DL. Multidisciplinary care and stepwise treatment for fibromyalgia. J Clin Psychiatry 2008;69:e35.
Brugha T, Bebbington P, Tennant C, Hurry J. The list of threatening experiences: a subset of 12 life event categories with considerable long-term contextual threat. Psychol Med 1985;15:189–94.
Busch AJ, Schachtler CL, Overend TJ, Pelosi PM, Barber KA. Exercise for fibromyalgia: a systematic review. J Rheumatol 2008;35:1130–44.
Campbell CM, Edwards RR. Mind-body interactions in pain: the neurophysiology of anxious and catastrophic pain-related thoughts. Transl Res 2009;153:97–101.
Elving B, Anderson T, Grooten WJ. Low levels of physical activity in back pain patients are associated with high levels of fear-avoidance beliefs and pain catastrophizing. Physiother Res Int 2007;12:14–24.
Goldberg DP, Williams P. A user’s guide to the General Health Questionnaire. Windsor: Nfer-Nelson; 1988.
Hardman AE. Physical activity and cancer risk. Proc Nutr Soc 2001;60:107–13.
Hassett AL, Cone JD, Patelia SJ, Sigal LH. The role of catastrophizing in the pain and depression of women with fibromyalgia syndrome. Arthritis Rheum 2000;43:2493–500.
Henderson HV, Velleman PF. Building multiple regression models interactively. Biometrics 1981;37:391–411.
Hunt JM, Silman AJ, Benjamin S, McBeth J, Macfarlane GJ. The prevalence and associated features of chronic widespread pain in the community using the ‘Manchester’ definition of chronic widespread pain. Rheumatology (Oxford) 1999;38:275–9.
Jones J, Rutledge DN, Jones KD, Maltallana L, Rooks DS. Self-assessed physical function levels of women with fibromyalgia: a national survey. Womens Health Issues 2008;18:406–12.
Karmisholt K, Gotzsche PC. Physical activity for secondary prevention of disease. Systematic reviews of randomised clinical trials. Dan Med Bull 2005;52:90–4.
Levi F, Pasche C, Lucchini F, Tavani A, La VC, Occupational and leisure-time physical activity and the risk of colorectal cancer. Eur J Cancer Prev 1999;8:487–93.
Macfarlane GJ, Jones GT, Knee AE, Aromaa A, McBeth J, Mikkelsen M, et al. The report of widespread body pain associated with long-term increased mortality? Data from the Mini-Finland Health Survey. Rheumatology (Oxford) 2007;46:805–7.
McBeth J, Silman AJ, McBeth J, Silman AJ. Widespread body pain and mortality: a prospective population based study. Br Med J 2001;323:662–5.
McBeth J, Silman AJ, McBeth J, Silman AJ. Association of widespread body pain with an increased risk of cancer and reduced cancer survival: a prospective, population-based study. Arthritis Rheum 2003;48:1686–92.
McBeth J, Symmonds DP, Silman AJ, Allison T, Webb R, Brammah T, et al. Musculoskeletal pain is associated with a long-term increased risk of cancer and cardiovascular-related mortality. Rheumatology (Oxford) 2009;48:74–7.
Prasad DS, Das BC. Physical inactivity: a cardiovascular risk factor. Indian J Med Sci 2009;63:33–42.
Rhyderch M, Edwards A, Marshall M, Elwyn G, Grod R. Developing a facilitation model to promote organisational development in primary care practices. BMC Fam Pract 2006;7:38.
Rockhill B, Willett WC, Hunter DJ, Manson JE, Hankinson SE, Colditz GA. A prospective study of recreational physical activity and breast cancer risk. Arch Intern Med 1999;159:2290–6.
Smith BH, Elliott AM, Hannonford PC. Pain and subsequent mortality and cancer among women in the Royal College of General Practitioners Oral Contraception Study. Br J Gen Pract 2003;53:45–6.
Stata Statistical Software, Stata. (Release 8.0). TX: Stata Corporation; 2003.
Tavani A, Raggia C, La VC, Costi E, Filiberti R, Montella M, et al. Physical activity and risk of cancers of the colon and rectum: an Italian case-control study. Arthritis Rheum 1999;48:1686–92.
Thune I, Lund E. Physical activity and risk of colorectal cancer in men and women. Br J Cancer 1996;73:1134–40.
Vanhonsveld K, Peters M, Goossens M, Linton S, Vlaeyen J. Applying the fear-avoidance model to the chronic whiplash syndrome. Pain 2007;131:258–61.
Wolfe F, Smythe HA, Yunus MB, Bennett RM, Bombardieri S, Goldenberg DL, et al. The American College of Rheumatology 1990 criteria for the classification of fibromyalgia. Arthritis Rheum 1990;33:160–72.
Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiatr Scand 1983;67:361–70.