Premorbid psychosocial factors are associated with poor health-related quality of life in subjects with new onset of chronic widespread pain – Results from the EPIFUND study

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ABSTRACT

Chronic widespread pain (CWP) is associated with poor health-related quality of life (HRQoL). It is unclear whether pain itself is the cause of poor HRQoL or other factors play a role. We hypothesised that new onset of CWP was associated with poor physical and mental HRQoL but that psychosocial risk markers for CWP onset would explain this relationship. A prospective population-based survey measured pain and psychosocial status at baseline. Subjects free of CWP at baseline were followed up 15 months later, when pain status, threatening life events and HRQoL (SF-12) were assessed. The risk associated with the new onset of CWP and reporting poor SF12-MCS and SF12-PCS was quantified using multinomial logistic regression (relative risk ratios (RRRs) with 95% confidence intervals (95% CI)), adjusted for age and gender. 3000 subjects (77%) free of CWP at baseline participated at follow-up. 2650 subjects (88%) provided full SF-12 and pain data and formed the cohort for this analysis. 9.4% of subjects (n = 248) reported new CWP. New CWP was associated with an increased risk of having the poorest SF12-MCS (RRR = 2.3; 95% CI 1.6–3.2) and SF12-PCS (RRR = 8.0; 95% CI 5.4–11.8) scores. After adjusting for baseline psychosocial status, the relationship between CWP onset and SF12-MCS was attenuated (RRR = 1.2; 95% CI 0.8–1.8), although the association with SF12-PCS remained (RRR = 4.8% CI 3.1–7.47). New onset of CWP is associated with poor mental and physical HRQoL. However, the relationship with mental HRQoL is explained by psychosocial risk markers.

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1. Introduction

Quality of life is a broad, multifactorial construct that assesses the degree of well-being felt by individuals and can vary with different cultural influences [33]. Health-related quality of life (HRQoL) is one aspect of this construct and although lacking in a singular definition [30], it is generally accepted as being concerned with the effect an individual’s health status has on their subjective physical, mental, emotional and social well-being [34]. The importance of the impact of musculoskeletal pain on HRQoL has been highlighted in The Bone and Joint Decade initiative (2000–2010) that aims “to improve the HRQoL for people with musculoskeletal disorders throughout the world” [45].

Painful musculoskeletal disorders, including fibromyalgia, a disorder characterised by chronic widespread pain (CWP), are associated with poor HRQoL [5,6,18,21]. Although levels of disability are similar between patients with fibromyalgia and rheumatoid arthritis (RA) [14,21,29] quality of life, particularly mental HRQoL, has been reported to be poorer in fibromyalgia patients [3,6,28,37]. The largest study of HRQoL in musculoskeletal disorders that compared patients with osteoarthritis of the hip, osteoporosis, RA and fibromyalgia, found reduced physical functioning in all disorders compared to healthy controls [28]. However, fibromyalgia was the only disorder to have significantly poorer scores on all mental health dimensions assessed using the Short Form-36 (SF-36) questionnaire [28]. A cross-sectional study reported a strong association between fibromyalgia and HRQoL and found that HRQoL in fibromyalgia patients was linked with self-reported disability levels [38]. Interestingly in the same study, the authors noted that mental health, as measured by the SF-36, explained the largest proportion of variance in the disability levels of fibromyalgia patients.

Poor psychosocial status has repeatedly been identified as a risk marker for the onset of fibromyalgia and CWP [11,20,23]. Our group has previously reported that subjects with high levels of illness behaviour and somatic symptoms had an increased risk of developing CWP [23]. We have also reported that high levels of
psychological distress observed in subjects with CWP were explained by factors associated with CWP, including somatic symptoms and fatigue, rather than the pain per se [24]. Depression has been shown to be correlated with HRQoL in fibromyalgia patients [35]. It is possible that among subjects with new onset of CWP, those with premorbid psychosocial symptoms may be more likely to report poor HRQoL.

The aim of this study was to test the hypothesis that new onset of CWP was associated with both poor mental and physical HRQoL, and that psychosocial risk markers for CWP onset, which are amenable to intervention, would explain these relationships.

2. Methods

2.1. Study design and subjects

A prospective population-based survey was conducted. Participants aged between 25 and 65 years were contacted via the registers of three primary care practices located in socio-economically diverse areas of North-West England. Subjects free of CWP at baseline who were eligible for follow-up (agreed to further contact and who had neither moved nor died in the interim period) were invited to take part in a second survey 15 months later.

2.2. Pain ascertainment

Subjects who answered positively to the question “During the past month have you experienced any ache or pain which has lasted for one day or longer?” were asked to shade on a body map (four figures: front, back, left and right sides) any area where they had experienced this pain. A further question asked whether they had been aware of these pains for more than 3 months. Trained observers coded the reported pain data using the definition of CWP in the American College of Rheumatology criteria for fibromyalgia (pain experienced in contralateral quadrants of the body above and below the waist and in the axial skeleton that has persisted for more than 3 months) [44]. The pain status of participants was ascertained using identical methods at both baseline and follow-up. Based upon these reports, subjects were classified into one of two groups – those with new onset of CWP and those remaining free of CWP.

2.3. Baseline questionnaire

The baseline questionnaire included a number of validated psychosocial scales:

2.3.1. General health questionnaire (GHQ) [9]

The GHQ is a measure of psychological distress. This version consists of 12 items (e.g. “in the past few weeks have you felt constantly under strain?”), each answered on a four point scale. For scoring purposes each response is dichotomised (0 = not at all/no more than usual or 1 = rather more/much more than usual) and then the 12 items are summed, giving a total GHQ score of between 0 and 12. A higher score on the GHQ is representative of higher levels of psychological distress.

2.3.2. Estimation of sleep problems scale [15]

This is a 4-item scale which assesses an individuals sleep problems in the past month. The questions cover the following components of sleep: onset, maintenance, wakefulness and non-restorative sleep. Each response is scored from 0 to 5 (not at all to 22–31 days per month). These are then summed giving a total sleep problems score of between 0 and 20, with a higher score representing increased levels of sleep disturbance.

2.3.3. Illness attitude scales (IAS) [17]

The IAS were designed to assess fears, attitudes and concerns about illness behaviour and health. A principal components analysis demonstrated that the IAS measures two particular dimensions, “health anxiety” and “illness behaviour” [31]. The health anxiety subscale consists of 11 items (such as “are you worried that you may get a serious illness in the future?”), each scored between 0 and 4, providing a total score of between 0 and 44 (general population mean score of 9.1 (standard deviation 6.9)). The illness behaviour subscale consists of six items (such as “how often do you see a doctor?”) with a total score ranging from 0 to 24 (general population mean score of 4.7 (standard deviation 4.2)).

2.3.4. Hospital anxiety and depression scale (HAD) [46]

The HAD is a 14-item scale, scored on a four-point likert scale, that was originally developed for use in patients with physical illness. Seven items measuring anxiety and seven measuring depression, over the last week, provide a total score of between 0 and 21 for each subscale. Higher scores on each scale represent an increased probability of an anxiety or depressive disorder being present, respectively.

2.3.5. Somatic Symptoms Checklist [26]

The Somatic Symptoms Checklist is a validated scale originally developed as a tool to diagnose somatization disorder by screening for a lifetime history of seven different items (yes or no answers). These items include troubled breathing, frequent pain in fingers or toes, frequent vomiting (when not pregnant), loss of voice, loss of memory and difficulty swallowing. A further seventh item, frequent trouble with menstrual cramps, is included for female participants. To avoid spurious associations with CWP onset, neither of the “pain” questions were included in the total score for this analysis. A third question, “have you ever had difficulties swallowing or had an uncomfortable lump in your throat that stayed with you for at least an hour?” was also excluded from the analysis due to a high proportion of missing answers. The total score is equal to the number of symptoms present and therefore ranged from 0 to 4.

2.4. Follow-up questionnaire

At follow-up, HRQoL and threatening life events were assessed.

2.4.1. Short-Form 12 (SF-12) [41]

This was the primary outcome of the study. The SF-12 is a validated shortened version of the SF-36 [25], an inventory originally designed to assess health status in the Medical Outcomes Study [25]. The 12 questions gather information on eight health concepts including, physical functioning, role limitations due to physical and emotional health, mental health, bodily pain, general health, vitality and social functioning. These items are then scored using a norm-based method providing a component summary scale score for both mental (SF12-MCS) and physical (SF12-PCS) HRQoL [42]. Scores range between 13–69 and 10–70 for the SF12-PCS and SF12-MCS scales, respectively, for the general USA population [42]. A lower score on the summary scales represents a poorer HRQoL. The SF-36, the parent of the SF-12, has been found to be a valid measure of generic HRQoL in musculoskeletal disorders [12] and the SF-12 has been used in other population-based studies of pain in the past [7].

2.4.2. Threatening life events inventory [4]

This inventory is a modified version of Tennant and Andrew's 1976 67-item life events inventory [36]. This shortened inventory asks about the occurrence of 12 events in the past 6 months that are associated with a long-term psychological threat. This list includes unemployment, financial crisis, problems with the police
and death of a first degree relative or close friend. The number of events experienced is summed, providing a total score of 0–12.

2.5. Data collection and statistical analysis

An intensive mailing strategy was used at both timepoints in order to achieve a high level of participation. Subjects who did not respond to the first questionnaire were contacted at fortnightly intervals with a reminder postcard, and if necessary a second questionnaire.

We were interested in subjects free of CWP at baseline and their subsequent CWP status at follow-up. Mental and physical HRQoL, as measured by the SF-12, were the outcomes of interest. For analysis purposes, participants’ scores on the SF12-MCS and SF12-PCS were categorised into tertiles: lowest third = poor HRQoL, middle third = moderate HRQoL and highest third = good HRQoL (referent group). Similarly, baseline psychosocial measures (except the Somatic Symptoms Checklist) and follow-up threatening life events were categorised into tertiles with good psychosocial state (lowest third of scores on these scales) as the referent group, the middle and highest thirds on these scales represented moderate and poor psychosocial state, respectively. Due to the distribution of its scores, the Somatic Symptoms Checklist was dichotomised into subjects reporting 0 symptoms or 1–4 symptoms. Initial descriptive statistics (chi-squared and Kruskal–Wallis tests) were used to describe study subjects characteristics with regard to their HRQoL status.

Univariate multinomial logistic regression was used to quantify the relationship between new onset of CWP at follow-up and SF12-MCS and SF12-PCS scores. We were also interested in whether baseline psychosocial risk markers, and follow-up threatening life events (assessed for the 6-months prior to follow-up), that predict the onset of CWP were associated with poor SF12-MCS and SF12-PCS scores, and quantified each of these relationships using the same univariate multinomial method. To determine the relative contributions of new onset of CWP and baseline psychosocial factors, and follow-up threatening life events, to SF12-MCS and SF12-PCS scores, a parsimonious multivariate model was constructed. To do so, all variables were included in a multivariate model and a manual backward elimination procedure was used. This involves removing the predictor variables one at a time and testing the significance of the “saturated” model (i.e. includes all variables) against the “unsaturated” model (i.e. minus the excluded variable), using a log likelihood ratio test. Variables were excluded if \( p > 0.05 \). Independent of the strength of the relationship CWP was retained in the model. Results are presented as relative risk ratios (RRRs) with 95% confidence intervals (95% CI). The RRR represents the risk of a poor or moderate HRQoL amongst exposed subjects (e.g. those scoring in the moderate or poorest thirds of the illness behaviour scale) compared to the risk in the unexposed subjects (those scoring in the lowest third). Factors were considered to be associated when the RRR \( > 1.5 \) or when the RRR < 0.67, this significant cut-off has been used previously [13].

The final stage of analysis was concerned with whether any observed relationships with SF12-MCS and SF12-PCS scores could be explained by a worsening in pain from baseline. Thus the final parsimonious multivariate regression models were adjusted for baseline pain status (i.e. reporting no pain or some pain at baseline). All univariate and multivariate logistic regression models were adjusted for age and gender. Statistical analysis was carried out using the statistical software package STATA (version 9) [32].

Ethical approval for this study was awarded by both the Local Research Ethics Committees (South Manchester and East Cheshire) and the University of Manchester. All subjects provided written informed consent to participate in the study.

3. Results

Fig. 1 summarises the participation of subjects from baseline to follow-up. A total of 77% \( (n = 3000) \) of subjects who were free of CWP at baseline and eligible for follow-up participated at the second stage of the study. However, 12% \( (n = 350) \) of these subjects did not provide SF-12 and/or pain information in their follow-up questionnaire. This analysis is therefore concerned with the 2650 participants (88%) who provided full data.

3.1. Characteristics of study subjects

The prevalence of CWP at follow-up was 9.4% \( (n = 248) \). The median age of subjects was 46.8 years \( (95\% \text{ CI} 46.0–47.5) \) and 55.7% \( (n = 1476) \) were female. The SF12-MCS scores ranged from 7.4 to 69.0, the median score was 53.0 \( (95\% \text{ CI} 52.7–53.3) \). This was categorised into thirds for analysis purposes: good = 55.7–69.0, moderate = 47.5–55.6, and poor = 7.4–47.4. The range of scores for SF12-PCS was 14.6–66.1, and median score 53.8 \( (95\% \text{ CI} 53.6–54.2) \). The thirds of the SF12-PCS were good = 55.4–66.1, moderate = 48.6–55.3, and poor = 14.6–48.5.

3.2. Association between age and gender and HRQoL

Table 1 shows the associations between age, gender, CWP status and psychosocial measures having poor, moderate and good SF12-MCS and SF12-PCS scores. Age was significantly different between each of the three levels of both SF12-MCS and SF12-PCS scales \( (p < 0.01) \). Older subjects had poorer SF12-PCS scores, whereas...
3.3. Association between pain status and HRQoL

SF12-MCS and SF12-PCS scores were significantly poorer in subjects with new onset of CWP compared to those who remained free of the disorder. Median scores were: SF12-MCS = 49.5 (95% CI 47.3–51.7) and 53.1 (95% CI 53.0–53.5), respectively; SF12-PCS = 45.5 (95% CI 43.2–47.2) and 54.2 (95% CI 53.9–54.4), respectively. Table 1 shows the breakdown of scores for the three categories of SF12-MCS and SF12-PCS.

Subjects with some pain at baseline were significantly more likely to have poor SF12-MCS and SF12-PCS scores compared to those subjects who reported having no pain (Table 1).

3.4. Association between psychosocial risk markers and HRQoL

High levels, representing a poor psychosocial state, of illness behaviour, health anxiety, psychological distress (GHQ), anxiety, depression, life events, sleep problems and reporting one or more somatic symptoms were associated with both poor SF12-MCS and SF12-PCS scores (p < 0.01) (Table 1). There was no significant statistical interaction between poor scores on “mood” variables (depression, anxiety, illness behaviour, health anxiety and psychological distress) and sleep or somatic symptoms, in predicting poor SF12-MCS or SF12-PCS scores.

3.5. Relationship with SF12-MCS

Subjects with new onset of CWP were twice as likely (RRR = 2.3; 95% CI 1.6–3.2) to have the poorest SF12-MCS scores compared to subjects free of CWP at follow-up (Table 2). This relationship was not observed for the moderate SF12-MCS category. Scoring in the moderate and poor category of all the psychosocial measures put subjects at an increased risk of having a moderate or poor SF12-MCS score at follow-up.

All significant associations were included in a multivariate model, and backward elimination was used to achieve the most parsimonious model. Variables that remained in this model are reported in Table 2. After adjustment for baseline psychosocial status CWP onset was no longer associated with SF12-MCS score (RRR = 1.2; 95% CI 0.8–1.8). However, subjects scoring in the moderate or poorest third of the GHQ, life events inventory, illness behaviour, health anxiety, HAD depression and HAD anxiety scales were all significantly more likely to report having the poorest SF12-MCS score compared to subjects scoring in the best third of these scales. The strongest of these relationships were observed with anxiety and depression, with subjects scoring in the poorest category of these scales being 4 (RRR = 4.1; 95% CI 2.8–6.1) and 5 (RRR = 5.4; 95% CI 3.5–8.4) times more likely to have the poorest SF12-MCS score, respectively.

3.6. Relationship with SF12-PCS

There was a significant increased risk of scoring in the moderate or poor categories of the SF12-PCS at follow-up in subjects who had new onset of CWP compared to those free of the disorder: RRR = 2.1; 1.4–3.2 and RRR = 8.0; 95% CI 5.4–11.8, respectively (Table 3). Subjects in the poorest two categories of sleep problems, anxiety, depression and life events were at an increased risk of having the poorest SF12-PCS scores. However, poor scores of health anxiety and illness behaviour, and reporting one or more somatic symptoms, put subjects at an increased risk of having either moderate or poor SF12-PCS scores.
The relationship between CWP onset and being in the poorest category of the SF12-PCS was attenuated in the parsimonious multivariate model (as shown in Table 3); however, there was still a 2-fold (RRR = 1.8; 95% CI 1.2–2.9) and 5-fold (RRR = 4.8; 95% CI 3.1–7.4) increased risk of having a moderate or poor SF12-PCS score, respectively. High levels (scoring in the poorest third) of baseline

### Table 2

Multinomial logistic regression analysis of the association between baseline psychosocial measures and CWP onset with SF12-MCS scores.

| Factor        | Category         | Univariate analysis<sup>a</sup> | Multivariate analysis<sup>a</sup> |
|---------------|------------------|-------------------------------|----------------------------------|
|               |                  | Moderate (47.5–55.6) n = 935 | Poor (7.4–47.4) n = 790         |
|               |                  | RRR 95% CI                    | RRR 95% CI                      |
|               |                  | Moderate (47.5–55.6) n = 935 | Poor (7.4–47.4) n = 790         |
|               |                  | RRR 95% CI                    | RRR 95% CI                      |

| CWP onset     | CWP free         | 1                             | 1                             |
|---------------|------------------|-------------------------------|--------------------------------|
|               | CWP              | 2.1                           | 1.4–3.2                        |
|               |                  | 8.0                           | 5.4–11.8                       |
|               |                  | 1.8                           | 1.2–2.9                        |
|               |                  | 4.8                           | 3.1–7.4                        |
| GHQ           | 0                | 1                             | 1                             |
|               | 1                | 0.8–1.7                       | 2.3                            |
|               |                  | 1.6                           | 1.1–2.3                        |
|               |                  | 1.8                           | 1.2–3.3                        |
|               |                  | 4.9                           | 3.2–9.2                        |
|               |                  | 1.7                           | 1.2–2.3                        |
| Sleep problems| 0–5              | 1                             | 1                             |
|               |                  | 1                             | 1                             |
|               |                  | 1.3                           | 1.1–1.7                        |
|               |                  | 1.8                           | 1.4–2.3                        |
|               |                  | 1.8                           | 1.4–2.3                        |
|               |                  | 1.6                           | 1.3–2.1                        |
| Somatic symptoms| 0                | 1                             | 1                             |
|               |                  | 1                             | 1                             |
|               |                  | 1.3                           | 1.0–1.6                        |
|               |                  | 1.8                           | 1.5–2.2                        |
|               |                  | 2.2                           | 1.8–2.7                        |
|               |                  | 1.8                           | 1.5–2.1                        |
| Health anxiety| 0–7              | 1                             | 1                             |
|               |                  | 1                             | 1                             |
|               |                  | 1.5                           | 1.2–1.8                        |
|               |                  | 2.3                           | 1.8–2.8                        |
|               |                  | 1.6                           | 1.3–2.0                        |
|               |                  | 1.9                           | 1.5–2.3                        |
| Illness behaviour| 0–5            | 1                             | 1                             |
|               |                  | 1                             | 1                             |
|               |                  | 1.5                           | 1.2–1.8                        |
|               |                  | 2.3                           | 1.8–2.8                        |
|               |                  | 1.8                           | 1.4–2.3                        |
|               |                  | 1.8                           | 1.4–2.3                        |
|               |                  | 1.8                           | 1.4–2.3                        |
|               |                  | 1.8                           | 1.4–2.3                        |

<sup>a</sup> High SF12-MCS category is the referent group; all models are adjusted for age and gender.

### Table 3

Multinomial logistic regression analysis of the association between baseline psychosocial measures and CWP onset with SF12-PCS scores.

| Factor        | Category         | Univariate analysis<sup>a</sup> | Multivariate analysis<sup>a</sup> |
|---------------|------------------|-------------------------------|----------------------------------|
|               |                  | Moderate (48.6–55.3) n = 947 | Poor (14.6–48.5) n = 712         |
|               |                  | RRR 95% CI                    | RRR 95% CI                      |
|               |                  | Moderate (48.6–55.3) n = 947 | Poor (14.6–48.5) n = 712         |
|               |                  | RRR 95% CI                    | RRR 95% CI                      |

| CWP onset     | CWP free         | 1                             | 1                             |
|---------------|------------------|-------------------------------|--------------------------------|
|               | CWP              | 2.1                           | 1.4–3.2                        |
|               |                  | 8.0                           | 5.4–11.8                       |
|               |                  | 1.8                           | 1.2–2.9                        |
|               |                  | 4.8                           | 3.1–7.4                        |
| GHQ           | 0                | 1                             | 1                             |
|               | 1                | 0.8–1.2                       | 2.0                            |
|               |                  | 1.6                           | 1.2–2.5                        |
|               |                  | 1.8                           | 1.4–2.3                        |
|               |                  | 4.9                           | 3.2–9.2                        |
|               |                  | 1.7                           | 1.3–2.3                        |
| Sleep problems| 0–5              | 1                             | 1                             |
|               |                  | 1                             | 1                             |
|               |                  | 1.3                           | 1.1–1.7                        |
|               |                  | 1.8                           | 1.4–2.3                        |
|               |                  | 1.8                           | 1.4–2.3                        |
|               |                  | 1.8                           | 1.4–2.3                        |
| Somatic symptoms| 0                | 1                             | 1                             |
|               |                  | 1                             | 1                             |
|               |                  | 1.5                           | 1.2–1.8                        |
|               |                  | 2.3                           | 1.8–2.8                        |
|               |                  | 1.8                           | 1.5–2.0                        |
|               |                  | 1.9                           | 1.5–2.3                        |
| Health anxiety| 0–7              | 1                             | 1                             |
|               |                  | 1                             | 1                             |
|               |                  | 1.5                           | 1.2–1.8                        |
|               |                  | 2.7                           | 2.2–3.3                        |
|               |                  | 1.3                           | 1.1–1.7                        |
|               |                  | 1.7                           | 1.4–2.2                        |
| Illness behaviour| 0–5            | 1                             | 1                             |
|               |                  | 1                             | 1                             |
|               |                  | 1.5                           | 1.2–1.8                        |
|               |                  | 2.6                           | 2.0–3.2                        |
|               |                  | 1.3                           | 1.1–1.7                        |
|               |                  | 1.9                           | 1.4–2.5                        |
| HAD anxiety   | 0–5              | 1                             | 1                             |
|               |                  | 1                             | 1                             |
|               |                  | 1.5                           | 1.2–1.8                        |
|               |                  | 2.6                           | 2.0–3.2                        |
|               |                  | 1.3                           | 1.1–1.7                        |
|               |                  | 1.9                           | 1.4–2.5                        |
| HAD depression| 0–3              | 1                             | 1                             |
|               |                  | 1                             | 1                             |
|               |                  | 1.2                           | 0.9–1.5                        |
|               |                  | 2.4                           | 2.0–3.0                        |
|               |                  | 1.1                           | 0.9–1.4                        |
|               |                  | 1.5                           | 1.2–2.0                        |
| Life events<sup>b</sup> | 0            | 1                             | 1                             |
|               |                  | 1                             | 1                             |
|               |                  | 0.9                           | 0.8–1.2                        |
|               |                  | 1.3                           | 1.0–1.6                        |
|               |                  | 2.3                           | 1.8–2.8                        |

<sup>a</sup> High SF12-PCS category is the referent group; all models are adjusted for age and gender.

<sup>b</sup> Life events during the 6 months prior to completion of the follow-up questionnaire.

Significant associations are highlighted in bold text.
illness behaviour (RRR = 7.0; 95% CI 4.9–9.85), sleep problems (RRR = 1.9; 95% CI 1.4–2.6) and reporting one or more somatic symptoms (RRR = 1.7; 95% CI 1.4–2.2) were also significant independent predictors of poor SF12-PCS scores. High levels of depression were moderately associated with poor PCS scores (RRR = 1.4; 95% CI 0.998–1.9), and, although this relationship was not statistically significant, a log likelihood test indicated that it was an important predictor and should be retained in the model.

3.7. Baseline pain status

Having some pain at baseline was associated with an increased risk of having CWP at follow-up (RRR = 6.0; 95% CI 4.1–8.8), and having the poorest SF12-MCS (RRR = 2.1; 95% CI 1.7–2.6) and SF12-PCS (RRR = 4.8; 95% CI 3.9–6.1) scores at follow-up. The final multivariate models were then adjusted for the presence of some pain at baseline. The relationship between new onset of CWP and SF12-MCS did not change (RRR = 1.2 95% CI 0.8–1.8). However, the risk of subjects with new onset of CWP being in the poorest third of the SF12-PCS remained, although slightly attenuated (RRR = 4.0; 95% CI 2.6–6.2).

3.8. Comparison of participants and non-participants at follow-up

Baseline measures were compared for participants (n = 2650) and non-participants, including subjects who did not respond or who did not provide complete data at follow-up (n = 1225), these results are presented in Table 4. Non-participants were more likely to be younger than participants (p = 0.02) and to report having some pain at baseline (p = 0.02). Scores on the GHQ, HAD anxiety and depression, and illness behaviour scales were poorer in non-participants than participants (p < 0.01). There was also a difference in somatic symptom scores between groups; however, the median and 95% CI was 0 and 0–0 for each.

4. Discussion

We have shown that subjects with new onset of CWP have an increased risk of reporting a poor SF12-MCS score. However, this relationship is explained by premorbid psychosocial risk factors that are associated with the onset of CWP. Anxiety and depression were the strongest independent predictors of a poor SF12-MCS score. The onset of CWP was also a significant predictor of poor SF12-PCS score. Although this relationship was partly explained by illness behaviour, somatic symptoms, depression and sleep problems, CWP onset remained an independent predictor. Further adjustment for having some pain at baseline did not explain this relationship, indicating that a poor SF12-PCS score was not simply a reflection of worsening pain symptoms. These results signify that poor mental HRQoL observed in subjects with new onset of CWP is predicted by prior psychosocial status, and that physical HRQoL is predicted by the onset of CWP, independently of prior poor psychosocial status.

Limitations to our study must be considered before discussing the importance of our findings:

(1) The SF-12 was used to assess HRQoL at follow-up. We were unaware of baseline scores and cannot comment on change in scores associated with new onset of CWP. SF-12 scores at follow-up may simply reflect baseline scores. Subjects who developed pain may have had poor baseline SF-12 scores that may have been due to the presence of disease. Subjects with an “organic” disease are likely to experience a reduction in their quality of life; however, the majority of CWP cases, up to 76% [22], are not explained by an obvious biological cause. It is therefore unlikely that approximately 25% of subjects with CWP who have an “organic” disease would explain our results.

(2) The psychosocial measures in the current study (including psychological distress, anxiety and depression) and the SF-12 as a measure of mental HRQoL are likely tapping into the same construct. It is possible that baseline psychosocial factors acted as a proxy for mental HRQoL. It is perhaps unsurprising that these are the factors that we found to predict a poor SF12-MCS score at follow-up. The strength of our study is in demonstrating that in addition to relationships with baseline psychosocial measures, the onset of CWP does not independently increase the risk of having a poor SF12-MCS score.

(3) After adjusting for baseline psychosocial factors, the onset of CWP remains strongly associated with poor SF12-PCS scores. Unmeasured confounders (diet, smoking behaviour, alcohol consumption) may further explain the relationship between new CWP and SF12-PCS scores. Arguably the most important unmeasured putative confounder is physical activity levels, which have previously been shown to be associated with physical HRQoL in fibromyalgia patients [2].

(4) Co-morbidities are common in subjects with CWP [1]. These co-morbidities may result in a reduction in HRQoL, independently of CWP. The presence of co-morbidities has not been recorded in the current study, and the possibility that a co-morbid physical condition resulted in the poor HRQoL observed in subjects with new onset of CWP at follow-up remains a possibility.

(5) Non-participants, as expected in postal surveys, were younger and had higher somatic symptom, GHQ, illness behaviour, anxiety and depression scores. Non-participants were also more likely to report some pain at baseline. Having some pain at baseline did not change the association between new onset of CWP and poor MCS scores, and attenuated, but did not explain the relationship between CWP onset and poor PCS scores. It is unlikely that this relationship would differ in non-participants.

(6) There is likely to be error in classification of exposures and outcome. The psychosocial measures used are well validated.

Table 4
Comparison of baseline measures between non-participants and participants at follow-up.

|                      | Non-participants | Participants | P-value |
|----------------------|------------------|--------------|---------|
|                      | n = 1225         | n = 2650     |         |
| Gender               |                  |              |         |
| Male                 | 548              | 1174         | 0.8     |
| Female               | 677              | 1476         |         |
| Baseline pain status |                  |              |         |
| No pain              | 478              | 1142         | <0.02   |
| Some pain            | 747              | 1508         |         |
| Age                  | 45.7             | 46.8         | 0.02    |
| Psychosocial scales  |                  |              |         |
| Sleep problems       | 5                | 5            | 0.08    |
| GHQ                  | 1                | 0            | <0.01   |
| Somatic symptoms     | 0                | 0            | <0.01   |
| Health anxiety       | 9                | 9            | 0.4     |
| Illness behaviour    | 5                | 4            | <0.01   |
| HAD anxiety          | 6                | 6            | <0.01   |
| HAD depression       | 3                | 3            | <0.01   |

*Non-participants include subjects who were eligible for follow-up (had not moved or died and had agreed to further contact at baseline) and who did not complete a questionnaire or provide full information at follow-up.

b All values are by Mann–Whitney U-test except gender and baseline pain status which are by chi-squared test.
and have previously been used in population-based studies of this kind. Any misclassification of these exposures is likely to be random across those who did and did not develop CWP. Therefore any misclassification would weaken an association, suggesting that the relationships we have reported could actually be an under-estimation of the true association. The ACR criteria [44] used to define CWP are the standard criteria for classification of CWP, as such they reflect subjects with a common disorder and allow comparison between studies involving CWP subjects. It is unlikely that we will have missed many subjects who developed CWP in the intervening 15-month period and who subsequently recovered before follow-up, as CWP is persistent in nature [27]. However, we will have missed details of specific incidents that may have occurred during the 15-month period that could have triggered the onset of CWP, or that have resulted in a reduction in HRQoL.

Our results show for the first time that psychosocial risk markers for the onset of CWP act as independent risk markers for poor HRQoL (as measured by the SF-12) observed in subjects with CWP. The treatment of CWP continues to pressure health care professionals, both at primary and at secondary levels, here we have highlighted the importance of non-pain-related factors that could be targeted in order to improve HRQoL in subjects with CWP. A prospective study of low back pain patients reported that anxiety and depression, as well as fear avoidance related to work and stress related to back pain, were important predictors of physical HRQoL 6 months after baseline [16]. Our findings support the importance of psychosocial markers in HRQoL outcomes for subjects with chronic pain.

To date treatment interventions for fibromyalgia patients that have targeted psychosocial markers, including cognitive behavioural therapy (CBT), have resulted in improved pain intensity, psychological status, and physical functioning [10,43]. A CBT intervention study of 145 fibromyalgia patients randomly assigned subjects to one of two programmes: (1) standard medical care or (2) standard medical care plus six sessions of CBT (targeted at physical function). Twenty-five percent of subjects in group 2 achieved a significant improvement in physical functioning 12 months after baseline, compared to only 12% in group 1 [43]. This was over a relatively short period although it does suggest the potential of CBT; however, the efficacy and long-term outcome of such treatments need to be studied in greater detail. The current study emphasises the importance of targeting markers of psychosocial status in CBT programmes that may lead to improvements in both mental and physical HRQoL amongst subjects with CWP. We have shown that illness behaviour predicts both mental and physical HRQoL, whereas high levels of health anxiety, psychological distress and anxiety are associated specifically with poor mental HRQoL. Depression which is strongly associated with poor mental HRQoL is only moderately associated with poor physical HRQoL. Similarly, sleep problems and somatic symptoms appear to be specific to a poor physical HRQoL. These results suggest that specific programmes may be required to successfully address the separate components of HRQoL. Why predictors for mental and physical components of HRQoL differ is not clear. However, it seems reasonable that sleep problems and somatic symptoms would manifest in poorer physical functioning and more “psychological” problems, such as anxiety and depression, would have a more detrimental affect on mental functioning. The nature of illness behaviour, a measure of hypochondriasis, suggests that it would affect both mental and physical HRQoL, as the association with both poor MCS and PCS scores in our study showed.

Mechanisms that may be important in explaining the poor HRQoL in subjects with CWP include the fear-avoidance model developed by Vlaeyen and Linton as an explanation for chronic low back pain [40]. It proposes that when pain is perceived as threatening then symptoms tend to be catastrophised, resulting in increased disability and depression. There is also evidence of “disuse syndrome” [39], where long-term avoidance of daily activities can result in increased physiological and psychological negative effects. Patients with chronic pain have been shown to have greater catastrophic coping strategies than those with acute pain [8]. It is likely that this “abnormal” coping strategy in subjects who are psychologically predisposed to CWP will also put them at a higher risk of having poor HRQoL.

It has yet to be shown whether the psychosocial factors which predict poor HRQoL also predict a continued poor quality of life in subjects with CWP. How HRQoL changes overtime in subjects with the disorder may be associated with the poor outcome these subjects have, including a higher risk of mortality [19]. Prioritising treatment approaches to CWP and fibromyalgia may help to limit the detrimental effects the disorder has on the quality of life of individuals. An in-depth consideration of individual patients coping strategies and psychological profile may also assist in determining the most appropriate and, ultimately successful, treatment path to take.

Conflict of interest

No author has a conflict of interest in this study.

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