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Is cognitive behaviour therapy for chronic fatigue syndrome also effective for pain symptoms?

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Abstract

Patients with chronic fatigue syndrome (CFS) frequently report chronic pain symptoms. Cognitive behavioural therapy (CBT) for CFS results in a reduction of fatigue, but is not aimed at pain symptoms. In this study, we tested the hypothesis that a successful treatment of CFS can also lead to a reduction of pain. The second objective was to explore possible mechanisms of changes in pain. The third objective was to assess the predictive value of pain for treatment outcome. Data from two previous CBT studies were used, one of adult CFS patients ($n = 96$) and one of adolescent CFS patients ($n = 32$). Pain severity was assessed with a daily self-observation list at baseline and post-treatment. The location of pain in adults was assessed with the McGill Pain Questionnaire (MPQ). Patients were divided into recovered and non-recovered groups. Recovery was defined as reaching a post-treatment level of fatigue within normal range. Recovered adult and adolescent CFS patients reported a significant reduction of pain severity compared to non-recovered patients. Recovered adult patients also had fewer pain locations following treatment. The decrease in fatigue predicted the change in pain severity. In adult patients, a higher pain severity at baseline was associated with a negative treatment outcome.

Keywords: Chronic fatigue syndrome; Cognitive behavioural therapy; Pain symptoms; Outcome

Introduction

Chronic fatigue syndrome (CFS) is characterised by severe fatigue lasting longer than 6 months and leading to functional impairment. CFS is neither the result of an organic disease or ongoing exertion nor alleviated by rest. According to the Centre for Disease Control (CDC) definition of CFS, the patient should have four out of eight additional symptom criteria (Fukuda et al., 1994). Four of these are pain symptoms, i.e. muscle pain, multi-joint pain, headaches and a sore throat. The other four are post-exertional malaise, unrefreshing sleep, concentration and/or memory impairments and sensitive lymph nodes. The frequency of pain symptoms in CFS differs between

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studies (King & Jason, 2005; Meeus, Nijs, & De Meirleir, 2007; Vercoulen et al., 1994) but is usually high. In the study of Vercoulen et al. (1994), the frequency of spontaneously reported pain symptoms ranged from 13% (sore throat) to 71% (muscle pain). King and Jason (2005) systematically assessed complaints and found much higher frequencies ranging from 60% for a sore throat to 93% for headaches and muscle pain. The chronic pain symptoms in CFS are disabling and compromise physical and social functioning (Meeus et al., 2007).

The aetiology of CFS is unknown, but cognitions and behaviour can perpetuate CFS (Prins, van der Meer, & Bleijenberg, 2006; Suraway, Hackmann, Hawton, & Sharpe, 1995). A statistically tested model of perpetuating factors in CFS showed that a low sense of control of symptoms and a focus on bodily symptoms had a direct causal effect on fatigue (Vercoulen et al., 1998). Furthermore, attributing the symptoms of CFS to a somatic cause produced low levels of physical activity which in turn had a negative causal effect on fatigue. More recently, it was found that a perceived lack of social support can also perpetuate the fatigue (Prins et al., 2004).

Several controlled trials have found that cognitive behaviour therapy (CBT) aimed at the perpetuating factors of CFS leads to a reduction of fatigue and disabilities (Whiting et al., 2001). A recent systematic review showed that of the eight CBT trials for CFS that have been performed, six reported a positive outcome (Chambers, Bagnall, Hempel, & Forbes, 2006). Most studies used fatigue as an outcome measure.

There are no interventions in the different treatment protocols for CFS that focus on pain symptoms, but it is implicitly assumed that an effective treatment of fatigue will also lead to a reduction of pain. Recently, it was shown that adolescents indeed report a decrease of muscle pain and headache following CBT for CFS (Stulemeijer, de Jong, Fiselier, Hoogveld, & Bleijenberg, 2005). However, the measure used was a four-point Likert scale in which the prevalence of pain had to be evaluated retrospectively over a period of 6 months. This type of pain assessment is easily influenced by situational circumstances and memory biases which can be prevented with the use of a pain diary (Smith & Safer, 1993). To our knowledge, there are no published data pertaining to the effect of CBT for CFS on pain in adult patients.

The first objective of this study was to determine whether an effective treatment of CFS with CBT also leads to a significant reduction of pain symptoms when these symptoms are evaluated with an appropriate assessment method. CBT is considered effective if a patient is recovered, that is reporting a level of fatigue within the range of healthy individuals (Prins, Bleijenberg, & van der Meer, 2002). In assessing pain symptoms we looked at pain severity and the location of the pain symptoms.

The second objective was to investigate the mechanisms of possible changes in pain severity following CBT. A central feature of CBT for CFS is the gradual increase of physical activity. It is possible that the increased activity levels also lead to a decrease of pain. CBT for CFS also aims to modify those cognitions and cognitive processes that perpetuate fatigue. The persistent focus on bodily symptoms or body consciousness is one of these cognitive processes (Vercoulen et al., 1998). If this focus is lessened as a consequence of therapy, it is likely that this generalises to other symptoms than fatigue, e.g. pain. Finally, CBT for CFS leads to a reduced negative affectivity, which could lead to a diminished report of physical symptoms (i.e. pain).

The third objective was to assess the predictive value of pain severity at baseline on the outcome of the treatment. Although physical activity has a positive effect on chronic pain in the long term (Busch, Schachter, Peloso, & Bombardier, 2002), increase in activity can have a negative influence on pain symptoms in the short term. Whiteside, Hansen, and Chauduri (2005) found that CFS patients reported a lower pain threshold following physical activity. In their study, the pain threshold of patients was repeatedly determined after graded exercise. Since graded activity is an important feature of CBT, this could mean that CBT leads to a lower pain threshold. This lower pain threshold might hamper the increase in activity level during therapy and could lead to a less favourable outcome of CBT. We suspected that this was especially true for those patients who already had a high pain severity at the start of the therapy. In determining the predictive value of pain for treatment outcome, we controlled for the relationship between pain and physical activity.

Methods

Subjects

To answer our research questions, data from two previous CBT studies with patients with CFS were used. In the first study, the outcome of CBT for CFS in adults was evaluated (Knoop, Bleijenberg, Gielissen, van der

Meer, & White, 2007). The effect of CBT on pain symptoms was not determined in this study. Ninety-six adult patients who met the CDC criteria for CFS participated in the study. They were severely fatigued and functionally impaired. Severe fatigue was defined by a cut-off score of 35 or higher on the subscale fatigue severity of the Checklist Individual Strength (CIS; Vercoulen et al., 1994). Functional impairment was assessed with the Sickness Impact Profile (SIP). The SIP consists of eight subscales measuring functional impairments of different domains of functioning. The scores on the subscales were added to provide one weighted score of general disability. A score of 700 or higher was used as a cut-off score (Van der Werf, De Vree, van der Meer, & Bleijenberg, 2003). The mean age of the adult patients was 37 years (S.D. = 11.5). Seventy-three patients were women (76%), and the median duration of the illness was 48.0 months (range = 264 months).

The second study used was a randomised controlled trial testing the effectiveness of CBT for adolescents with CFS (Stulemeijer et al., 2005). Patients included in this study were between 10 and 17.2 years old. They met the CDC criteria for CFS. In this study, severe fatigue was defined as having a score of 40 or higher on the CIS subscale fatigue severity. The cut-off score for adolescents is higher than for adults because the mean fatigue severity in healthy adolescents is also higher (Stulemeijer et al., 2005). Severe functional impairment was operationalised as having a weighted score of 65 or less on the SF-36 Physical Functioning scale. The score on this subscale can range from 0 (maximum physical limitations) to 100 (ability to do vigorous activity). The CBT group consisted of 35 adolescents with a mean age of 15.6 years (S.D. = 1.3); 31 patients were female (89%) and the median duration of the illness was 16.0 months (range = 44 months). Three patients did not start with the treatment and only the data of the 32 patients who started with CBT after baseline assessment were used for further analysis.

Design

All patients were assessed at baseline and post-treatment. Patients were divided into a recovered and non-recovered group based on their post-treatment score on the CIS subscale fatigue severity. The definition of recovery in adult CFS patients was based on a previous randomised controlled trial that tested the effectiveness of CBT for adult CFS patients (Prins et al., 2001). In this study, adult patients were considered recovered if their score on the CIS subscale fatigue was lower than 36. This score is within two standard deviations of the mean of a healthy adult control group (Vercoulen, Alberts, & Bleijenberg, 1999; Vercoulen et al., 1994). Using this criterion created a potential overlap with the cut-off score that was used for including patients in the adult study (scoring 35 or higher on the CIS subscale fatigue; Knoop et al., 2007). However, as no patient in this latter study actually scored lower than 36, we could use scoring lower than 36 as a criterion for recovery for adult patients. The original CBT study with adolescent CFS patients used a criterion of scoring lower than 35.7 on the CIS subscale fatigue (Stulemeijer et al., 2005). This is a more strict criterion than the one used in adult patients, as a score of 35.7 represents the mean plus one standard deviation of a healthy adolescent control group (Stulemeijer et al., 2005). We used this cut-off score as a criterion for recovery for adolescent patients.

Sixty-three adult patients (66%) had a CIS score lower than 36 at post-treatment and were considered recovered; the remaining 33 patients formed the non-recovered adult group. Of the 32 adolescents, 21 (66%) scored lower than 35.7 and were considered recovered, 11 did not recover. In the analysis, the effect of CBT on pain for recovered and non-recovered patients was compared. For the adolescent study, there were also data available from a waiting list control group. We did an additional analysis in which the effect of CBT on pain symptoms was compared with the waiting list condition.

Assessment

Fatigue

The CIS subscale fatigue severity indicates the level of fatigue experienced over the past 2 weeks. The CIS consists of eight items on a seven-point scale. The score can range between 8 and 56. The CIS has been validated and is reliable (Stulemeijer et al., 2005; Vercoulen et al., 1994, 1999).

Pain

Adolescent and adult patients rated their pain on a daily self-observation list four times a day during a period of 12 days, on a scale ranging from 0 (no pain) to 4 (very severe pain). The daily pain score could range between 0 and 16, and the total 12 daily pain scores were averaged into one daily observed pain (DOP) score. The DOP score was compared with the scores of a reference group of 90 healthy people, consisting of 35 men and 55 women (mean age = 37.1, S.D. = 10.9) who participated as healthy controls in previous studies. Their mean DOP score is 1.0 (S.D. = 1.3).

Adult patients also completed the McGill Pain Questionnaire (MPQ; Melzack, 1975; Van der Kloot, Oostendorp, van der Meij, & van den Heuvel, 1995). The MPQ included a whole body outline to indicate the distribution of pain.

To determine the frequency of CDC pain symptoms at baseline, both adolescent and adult patients filled in a questionnaire where they had to report on a four-point scale how often during the last 6 months they had experienced muscle pain, headache, multi-joint pain and sore throat. Scores on each of the four items ranged from 1 to 4 (1 = never, 2 = several times a month, 3 = several times a week, 4 = every day).

Physical activity

Physical activity level was measured in adolescent and adult patients at baseline with an actometer, a motion-sensing device worn at the ankle that quantifies physical activity. The actometer detects movements of the leg (e.g. during walking or climbing stairs). The actometer was worn 12 consecutive days and nights. A general physical activity score that expressed the mean activity level over this period in the mean number of accelerations per 5-min interval was calculated (Van der Werf, Prins, Vercoulen, van der Meer, & Bleijenberg, 2000). Research has shown that the actometer yields highly reliable data and is a valid instrument for measuring physical activity (Vercoulen et al., 1997).

Negative affectivity

Negative affectivity was operationalised as the level of depressive symptoms. This was assessed only in adults with the subscale depression of the SCL90 (Arrindell & Ettema, 1981).

Body consciousness

The subscale private body consciousness of the Body Consciousness Questionnaire was used to measure the tendency of adolescent and adult patients to focus on bodily symptoms. This subscale has five items that can be answered on a scale from 0 (extremely uncharacteristic) to 4 (extremely characteristic). It has been used before in studies of CFS patients (Van der Werf, De Vree, van der Meer, & Bleijenberg, 2002).

There were two assessments, one at baseline and one directly following termination of the treatment. At each assessment the patient visited the hospital twice in a period of 2 weeks. During the first visit, the patient completed all the questionnaires and received the actometer and daily self-observation list. After 2 weeks, the patient brought the daily self-observation list and actometer back.

Intervention

Adult patients received CBT for CFS according to the protocol described by Bleijenberg, Prins and Bazelmans (2003). The treatment consisted of 16 sessions over a period of 6 months and was aimed at changing fatigue-related cognitions and a gradual increase of activities. For adolescents, a protocol was designed that consisted of 10 sessions over a period of 5 months (see also Stulemeijer et al., 2005). Adolescents received fewer sessions because experience has found that a positive outcome can be reached quicker.

Statistics

The *t*-tests were used to analyse the effect of CBT on pain severity. The change in DOP score from baseline to post-treatment of the recovered groups was compared with the change in DOP score of the non-recovered groups. The differences in the percentage of recovered and non-recovered patients who had a DOP score within normal limits (when compared to healthy controls) were tested with a chi-square test. Within normal limits was defined as having a DOP score of 2.3 or lower (i.e. within the range of the mean plus one standard deviation of the controls). The same analyses with the DOP score were done when the total group of adolescents who received CBT was compared with the group of patients from the waiting list. The differences in the percentages of recovered and non-recovered adult patients who report pain at the locations identified with the MPQ at baseline and post-treatment were tested with a chi-square test. To determine the possible mechanisms of a change in pain, a stepwise multiple regression was performed with change in DOP score as dependent factor, the change in fatigue severity score, activity level, negative affectivity and body consciousness as predictors and the DOP score at baseline as covariate. For the adolescent group, the same regression was done but without the variable negative affectivity (no data available). For all the predictors, the differences between baseline and post-treatment were first tested with a pairwise *t*-test. To determine the predictive value of pain symptoms, a multiple regression analysis was performed with the change in CIS fatigue as dependent variable and the mean DOP score, mean activity level and CIS score at baseline as predictors. Finally, all regression analyses were repeated with residualised instead of raw change scores. Significance in all analyses was assumed at $p<0.05$. Statistical analysis was performed using SPSS version 12.0.

Results

Pain symptoms at baseline

All but one of the adult patients had one or more of the four CDC pain symptoms. All adolescent patients had one or more CDC pain symptoms. Table 1 shows the percentage of patients who reported at baseline that daily or several times a week they experienced muscle pain, headache, multi-joint pain or a sore throat.

The percentage of adult patients with pain at a location identified with the bodily outline of the MPQ is shown in Table 2. Seventy-three patients (78%) reported pain in two or more locations. The MPQ also assesses the duration of pain complaints in five categories: <1 year, 1–2 years, 2–3 years, 3–4 years or >4 years. In 53% of the patients, the pain complaints were present for more than 3 years. At baseline, 37% reported on the MPQ that they used pain medication.

The effect of CBT on pain: comparison of recovered with non-recovered patients

In both the adult and the adolescent CFS patients, the DOP score decreased from baseline to post-treatment (Fig. 1). The difference in the mean change in DOP score of the recovered adult group (−2.01; 95% CI −2.62 to −1.39) and the non-recovered adults (−0.22; 95% CI −0.85 to 0.41) was statistically significant ($t = 3.74$, d.f. = 93, $p< 0.001$). In the adolescent study, the mean change in DOP score of recovered patients (−3.76; 95% CI −5.69 to −1.84) was also significantly larger than that of non-recovered patients (0.14; 95% CI −0.77 to 1.04; $t = 2.96$, d.f. = 30, $p = 0.006$).

Fourteen out of the 21 recovered adolescent CFS patients (67%) had a pain level within the range of healthy controls after CBT. In the non-recovered adolescent group, four out of 11 reached this level (36%, $\chi^2 = 2.694$, d.f. = 1, $p = 0.10$). Significantly more recovered adults (36/63; 57%) than non-recovered adults (3/33; 9%) reached a normal pain level ($\chi^2 = 20.73$, d.f. = 1, $p<0.001$).

The percentage of adult CFS patients with pain in locations identified with the MPQ at baseline did not differ significantly between recovered and non-recovered adults. Following treatment, recovered patients reported significantly less pain in neck and/or shoulders, legs, arms and chest compared to non-recovered patients (see Table 3).

The effect of CBT on pain compared to a waiting list in the original adolescent study

The original adolescent study was a randomised controlled trial in which CBT for CFS was compared with a waiting list condition (Stulemeijer et al., 2005). We also calculated the DOP scores for all patients of the

Table 1
Percentage (and number) of CFS patients with pain symptoms daily or several times a week

Symptom	Adults ($n = 95$[a]) with pain	Adolescents ($n = 32$) with pain
Muscle pain	72% ($n = 68$)	60% ($n = 19$)
Headache	50% ($n = 48$)	75% ($n = 24$)
Multi-joint pain	58% ($n = 55$)	60% ($n = 19$)
Sore throat	17% ($n = 16$)	19% ($n = 6$)

[a]For one adult patient there were no data of the pain assessment available.

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Table 2
Percentage (number) of adult patients at baseline with pain on locations identified with the MPQ

Localisation	Adults ($n = 94$[a]) with pain
Head	64% ($n = 60$)
Neck and/or shoulders	61% ($n = 57$)
Legs	56% ($n = 53$)
Arms	48% ($n = 45$)
Low back	34% ($n = 32$)
Stomach	22% ($n = 21$)
Chest	11% ($n = 10$)

[a]For two adult patients there were no data of the MPQ at baseline available.

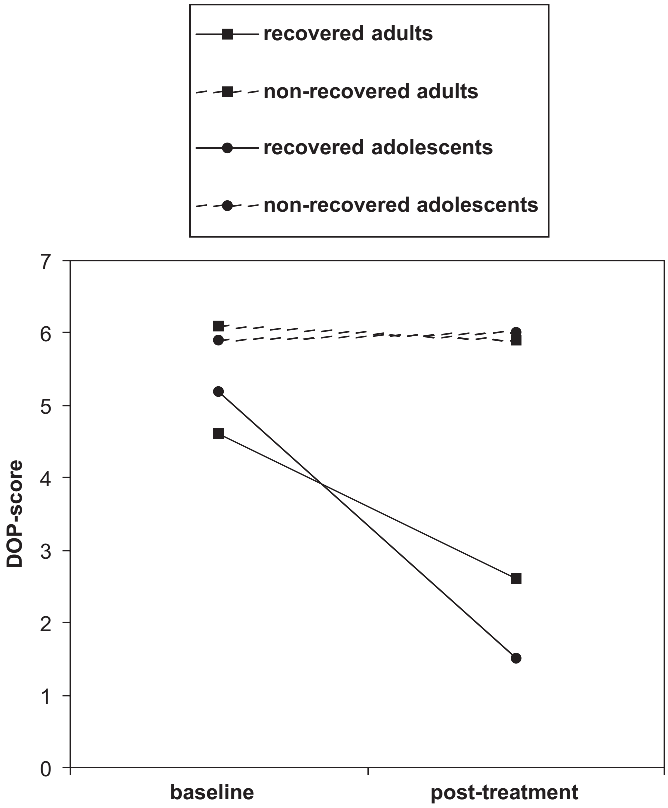

Fig. 1. Mean DOP score of adult and adolescent CFS patients before and after treatment.

original study. In case of missing data, the last observation was carried forward. The difference in DOP score in the CBT group ($n = 35$) between baseline and second assessment was significantly greater than in the waiting list ($n = 34$) condition (-2.21, S.D. $= 3.85$ versus -0.36, S.D. $= 2.19$; $t = -2.44$, d.f. $= 67$, $p = 0.017$). Furthermore, at the second assessment there were significantly fewer patients in the waiting list with a pain level within the range of healthy controls (29%) than in the CBT condition (56%, $\chi^2 = 4.38$, d.f. $= 1$, $p = 0.04$).

The mechanism of changes in pain

In both adults and adolescents, there was a significant decrease in fatigue and a significant increase in physical activity following treatment (see Table 4). In adults, body consciousness and negative affectivity

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Table 3
Percentage of adult patients with pain on a specific location following CBT

Localisation	Recovered adults (%) ($n = 63$)	Non-recovered adults (%) ($n = 33$)	χ^2-value[a]	p-value
Head	29	46	2.74	0.098
Neck and/or shoulders	22	55	10.18	0.001
Legs	22	52	8.50	0.004
Arms	16	46	9.84	0.002
Low back	22	30	0.75	0.385
Stomach	10	12	0.16	0.692
Chest	0	18	12.22	<0.001

[a] χ^2-test.

Table 4
Change scores in scores of predictors after treatment

	Adults	t-value[a] (d.f.)	p-value	Adolescents	t-value[a] (d.f.)	p-value
ΔFatigue (CIS)	−19.7 (14.1)	−13.6 (95)	<0.001	−24.3 (15.7)	−8.7 (31)	<0.001
ΔPhysical activity (actometer)	10.4 (21.3)	4.7 (94)	<0.001	10.3 (21.7)	2.5 (27)	0.019
ΔBody consciousness (BCS)	−0.7 (1.8)	−4.0 (95)	<0.001	−0.1 (1.8)	−0.5 (28)	0.780
ΔNegative affectivity (SCL-90[b])	−6.2 (8.4)	−7.5 (95)	<0.001			

[a] Pairwise t-test.
[b] No data on the SCL90 available in adolescents.

decreased significantly. In adolescents, the decrease in body consciousness was not significant. A stepwise multiple regression with the baseline DOP score as covariate showed that the change in fatigue severity between baseline and post-treatment was significantly related to the decrease in the DOP score (see Table 5) of both adults and adolescents. The other change scores were not related to the change in DOP score. We repeated the stepwise multiple regression but now used residualised change scores. This gave the same pattern of results. In adults the residual change score in fatigue was the only significant predictor of the change in pain ($\beta = 0.61$, $p = <0.001$; R^2 adjusted $= 0.36$). The residual change score in fatigue was also the only the predictor of the change in pain in adolescents ($\beta = 0.55$, $p = 0.002$; R^2 adjusted $= 0.28$).

The predictive value of pain symptoms for treatment outcome

Multiple regression showed that the DOP score at baseline was a significant predictor of the change in fatigue in adult patients (see Table 6). The regression with the residualised change in fatigue gave the same result (β DOP $= -0.26$, $p = 0.011$; R^2 adjusted $= 0.06$). In adolescent CFS patients, DOP did not predict outcome (Table 6). This was also true when the residualised change in fatigue was used (β DOP $= -0.09$, $p = 0.612$). In all analyses the level of physical activity at baseline was not a predictor of the change in fatigue in both groups.

Discussion

The first objective of this study was to determine if an effective treatment of CFS with CBT leads to a reduction of pain symptoms. It was remarkable to find that a treatment aimed at reducing fatigue also had an effect on pain. Patients who recovered following CBT for CFS reported a reduction of pain severity. Furthermore, more recovered than non-recovered adults had a level of pain following treatment that is comparable to healthy controls. The results also showed that most adults report widespread pain before treatment and that after CBT the number of pain locations decreased in the recovered patients.

Table 5
Stepwise multiple regression with change in DOP score as dependent variable and baseline DOP score as covariate

	Adults ($n = 95$[a])		Adolescents ($n = 28$[a])	
	B	β	B	β
Constant	−2.59		−4.83	
Baseline DOP score	0.43	0.53**	0.72	0.69**
ΔFatigue (CIS)	0.07	0.54**	0.13	0.45**
Not in equation				
ΔPhysical activity (actometer)				
ΔNegative affectivity (SCL90)[b]				
ΔBody consciousness (BCS)				
R^2 adjusted	0.46		0.54	

[a]Data of one adult and four adolescents missing.
[b]No data on the SCL90 available in adolescents.
**$p<0.01$.

Table 6
Prediction of change in CIS-fatigue with DOP, CIS-fatigue and physical activity score at baseline

Predictor[a]	Adults ($n = 95$[b])		Adolescents ($n = 31$[b])	
	B	β	B	β
Constant	−17.64		11.62	
DOP	−1.35	−0.28**	−0.34	−0.08
CIS-fatigue	0.81	0.30**	0.21	0.05
Physical activity score	0.06	0.09	0.05	0.08
R^2 adjusted	0.09		−0.09	

[a]Multiple regression, method enter.
[b]In both groups the data of one person was missing.
**$P<0.01$.

The second objective of the study was to look at possible mechanisms for the decrease in pain. Changes in physical activity, changes in negative affectivity or changes in body consciousness could not explain the decrease in pain severity. Only a relationship between the decrease in fatigue and the decrease in pain was found. This implies that pain in CFS is part of the syndrome and is directly related to chronic fatigue. It would be interesting to look at other variables that could explain the decrease in pain (and fatigue). Perhaps not focussing on bodily symptoms per se, but the negative labelling of those symptoms might be a more important factor. The role of catastrophising pain symptoms in the perception of pain has been extensively studied (Vlaeyen & Linton, 2000). The role of catastrophising fatigue in CFS is largely unknown. It would be interesting to study the relationship between changes in the catastrophising of fatigue and pain in CFS and the reduction of these symptoms following CBT.

The third objective was to investigate the predictive value of pain severity for the outcome of CBT for CFS. Although the amount of variance explained was modest, pain severity at baseline was a significant predictor: a high pain severity at the start of the treatment was associated with a smaller decrease in fatigue. This was not the case in the group of adolescent patients, possibly because of the relatively small group size in the adolescent study, resulting in a lack of statistical power. Alternatively, pain symptoms in adolescents might be different from those in adults. However, the fact that the pattern of results after treatment was the same in both groups speaks against the latter explanation.

How can we understand that pain in CFS can be successfully treated with CBT and closely follows the decrease in fatigue while at the same time recognising that pain is a negative predictor of treatment outcome? A review by Cho, Skowera, Cleare, and Wessely (2006) suggests that there is a possible distinction between

CFS and chronic widespread pain (as in fibromyalgia) with only a partial overlap. One could assume that if pain in CFS patients becomes more severe, these patients become more comparable to patients with syndromes in which the chronic widespread pain is the central feature (like fibromyalgia). In those cases, interventions exclusively aimed at the fatigue do not seem sufficient to reach recovery. This would be in accordance with the finding of different alterations in hypothalamic–pituitary–adrenal axis (HPA axis) functioning between CFS, fibromyalgia and patients meeting criteria for both conditions (Cho et al., 2006).

The fact that pain severity predicted therapy outcome suggests that a subset of CFS patients could possible benefit from additional interventions aimed at pain symptoms. A gradual increase of physical activity and the reformulation of pain-related beliefs into more adaptive beliefs can be considered important elements of CBT for chronic pain (Morley, Eccleston, & Williams, 1999). Increasing physical activity is already an element of CBT for CFS. Additional interventions should be focussed on the reformulation of pain-related cognitions, e.g., the catastrophising of pain or fear of pain (Vlaeyen & Linton, 2000).

In this study, we wanted to know if a successful CBT would have an effect on pain symptoms. We only looked at the effect of a successful treatment of fatigue because clinical experience suggested that only then pain symptoms decrease. To generalise our findings to CBT for CFS in general (successful or not), we had to test whether the pain reduction in CBT for CFS is greater than in a control group in a randomised controlled trial. The original adolescent study was a randomised controlled trial and a comparison of the CBT group with the waiting list also showed that the decrease in pain severity following CBT for CFS was larger than in a non-treated control group. This confirmed the positive effect of CBT for CFS on pain symptoms. For adults no data were available of a controlled study with a no-treatment control group.

A weakness of our study is that the role of medication on pain symptoms could not be properly analysed. In the adult study, information about the type of medication and the dosage was missing, and for adolescent CFS patients information about pain medication was lacking entirely.

A second weakness of the study is that we did not correct the significance level for the number of hypotheses tested and/or the number of statistical analyses used to test the hypotheses. This increases the risk for type I errors. We think this is justified, as our study is explorative and one of the first to investigate the effect of CBT for CFS on pain. However, our findings have to be replicated.

The most clinical relevant finding of the present study is that pain symptoms improve following CBT for CFS. A possible clinical implication is that adding interventions aimed at the restructuring of pain-related cognitions, especially in adult CFS patients with higher pain scores, may increase the percentage of patients who benefit from CBT for CFS. Future research will have to show if this hypothesis is correct.

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