COGNITIVE DISTORTIONS OF SOMATIC EXPERIENCES: REVISION AND VALIDATION OF A MEASURE

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Abstract - The article reports oil tile revision of tile Cognitive Errors Questionnaire (CEQ). The CEQ which was originally developed to measure cognitive distortions specific to chronic pain, has been significantly shortened and made applicable to a wider range of somatic problems. The Cognitive Errors Questionnaire - Revised (CEQ-R) contains two subscales: Somatic-distortions specific to somatic experiences; and General-distortions to everyday life events. Validation of the scale with CFS, depressed, and chronic pain groups crud healthy controls confirms the CEQ-R loads onto general and somatic factors. Both subscales Dave high internal consistency and good test-retest reliability. 'File pattern of subjects' responses to tire CEQ-R scores showed that the depressed group scored significantly higher on the General CEQ-R scale than tile other groups, whereas the CFS and chronic pain groups scored higher than healthy controls on the Somatic CEQ-R. Somatic CEQ-R scores showed a significant decrease over tile course of a pain management program, with a concomitant decrease in disability and depression scores. Further analyses showed the Somatic CEQ-R to be significantly related to self and symptom focusing, whereas the General CEQ-R was found to be significantly correlated with higher depression, lower self-esteem, and self focusing. The CEQ-R may be a useful instrument to examine the relationship between cognitive distortions and disability in a variety of illnesses, and to differentiate primary depression from overlapping somatic disorders. © 1997 Elsevier Science Inc.

Keywords: Cognitive distortion; Catastrophizing; Assessment; Chronic fatigue syndrome (CFS); Chronic pain; Depression.

INTRODUCTION

Cognitive factors are becoming increasingly recognized as crucial to the understanding of conditions such as chronic fatigue syndrome (CFS) and chronic pain, where traditional biomedical models are unable to explain the extent of the disability and the symptoms experienced by these patients. The cognitive factors that appear to be most significant in both the onset and maintenance of these disorders are the beliefs that patients hold about their illness and the way in which they interpret their symptoms [1-3].

One aspect of illness cognitions which has been extensively investigated in the chronic pain field is cognitive distortion. The concept of cognitive distortion is borrowed from cognitive models of depression [4, 5] and refers collectively to errors of logic in interpreting situations. Beck and colleagues identified a number of specific errors, including selective
abstraction-focusing oil the negative aspects of an experience; overgeneralizing - assuming that the negative consequences of one experience apply to similar events in the future; personalization-seeing oneself as personally responsible for negative situations; and catastrophizing-expecting the worst possible outcome to occur [5].

The error of catastrophizing has received the most attention in the pain literature, with the most commonly used measure being the catastrophizing or CAT subscale of the Coping Strategies Questionnaire [6]. This subscale has good psychometric properties, is short to administer, and has been consistently associated with depression, intensity of symptoms, and disability in chronic pain [3, 7-9]. In addition, high CAT scores have been associated with attrition from a pain management program [10], whereas decreases in CAT scores following treatment have been associated with reductions in depression and physician visits [11]. Although the predictive validity of the CAT is well established, its unique contribution to chronic pain is questionable, as it appears to be confounded with depression. Sullivan and D'Eon [12] observed that a number of the CAT items closely reflect classic depressive errors rather than pain specific ones (e.g., “I feel my life isn't worth living”). They found that, when controlling for depression, the associations between the CAT and outcome in chronic pain were no longer significant. Furthermore, the CAT is incorporated in a coping scale and it could be argued that catastrophizing is more accurately conceptualised as a belief or automatic way of evaluating a situation, rather than a coping strategy. Coping is generally considered to be a purposeful response to a situation and does not normally include automated responses [7].

Another questionnaire developed to measure distorted thinking in chronic pain is the Cognitive Errors Questionnaire or CEQ [13]. This questionnaire has a number of advantages over the CAT as it not only measures catastrophic thinking, but also includes errors of selective abstraction, personalization, and overgeneralization. It is divided into two subscales, one which measures errors associated with general life events, and one which measures distortions specific to the experience of pain. The two subscales are able to discriminate clearly between depression and chronic pain [13, 14]. Even when controlling for general distortions and pain severity, pain-specific distortions account for a significant proportion of the disability and distress reported by chronic pain patients [15, 16]. Despite these findings, only a small number of studies have made use of the CEQ. There may be two reasons for this. First, it consists of 48 fairly lengthy items, which makes it somewhat laborious to complete; and second, few studies have investigated the psychometric properties of the scale. One of the aims of the present study was to create a more concise version of the questionnaire and to provide a more detailed account of the psychometric properties of the revised scale.

We were also interested in creating a questionnaire that was applicable to patient groups other than chronic pain. Although the CEQ has been shown to be a useful measure with rheumatoid arthritis (RA) populations [17, 18] the items are still specific to the experience of pain. Our earlier work on CFS suggests that catastrophic thinking plays a role in this disorder [19], whereas others suggest that it may be important in other illnesses and medical encounters [20, 21]. Specific cognitive distortions may also help distinguish between disorders with considerable nosological overlap, such as depression and CFS. For instance, CFS patients are less likely than depressed patients to report feelings of low self-esteem and guilt [22, 23].

Interestingly, illness attributions between the conditions also vary. Depressed patients are more likely to attribute their condition to personal weakness or vulnerability, whereas CFS sufferers most often see the cause as external and out of their control. It may be that these underlying cognitions are reflected in distinct clinical presentations and explain the fact that, although CFS patients do have a very negative view of their illness (24), they do not have a poor self-concept.
We sought to examine this idea further and hypothesized that, whereas depressed patients' schema are dominated by negative self-perceptions, CFS patients' schema are dominated by perceptions of themselves as seriously ill people. These illness schema may lead to distortions in thinking specific to somatic rather than interpersonal events. Understanding how negative illness schema are maintained over time is important, as negative illness beliefs appear to be associated with disability in this disorder [1, 25], and cognitive behavioural treatment which assists patients in re-evaluating their illness has been shown to substantially reduce this disability [26, 27].

For us to test this hypothesis and to advance study in this area we needed to develop or revise a measure of cognitive distortion that would be applicable for CFS patients. Further, there are a number of other conditions, such as fibromyalgia, multiple chemical sensitivity, tinnitus, irritable bowel syndrome, and chronic pelvic pain, which overlap with CFS and chronic pain, in that they present with idiopathic physical symptoms and have a high incidence of depressive disorders. These conditions report a comparable range of somatic symptoms and similar levels of past and current psychiatric disorder [28, 29]. As such, a questionnaire which measures distortions in thinking related to a broad range of somatic experiences, rather than just pain-related symptoms, might be a useful measure across such disorders. Because the CEQ assesses a range of errors and does not appear to be confounded with either depression or pain severity we felt that it provided the appropriate foundation for our questionnaire.

**METHOD**

**Revision of the CEQ**

We reduced the original number of CEQ items by half, by removing items with overlapping or similar content and items that were solely relevant to the American population. The structure of the original questionnaire was maintained such that each item describes a particular everyday situation involving either work; recreation, or family activities, followed by a thought that a person in that situation may have. The thoughts were worded to reflect the errors of overgeneralizing, selective abstraction, catastrophizing, and personalization, and were rated on a five-point scale ranging from “almost exactly like I would think” to “not at all how I would think.” Equal numbers of each of the errors were included in the subscales and were presented in a random order, so that the revised CEQ or CEQ-R consisted of two 12-item subscales-the General CEQ-R and the Somatic CEQ-R. These subscales are presented in the Appendix. The wording and nature of some of the original General CEQ items were modified to have a wider application. The Somatic CEQ-R was derived by altering items from the pain-related CEQ to include the experience of a range of everyday somatic symptoms such as aches and pains, muscle weakness/stiffness, and general fatigue. Alterations were also based in part on the qualitative responses we obtained from earlier research on CFS [19].

**Participants**

The psychometric features of the CEQ-R were evaluated on three illness groups and a healthy comparison group, totaling 141 participants ranging from 18 to 65 years of age. The CFS patients were volunteers recruited from a general practice specialising in the treatment of CFS. All patients underwent standard medical screening procedures to eliminate alternative medical and psychiatric diagnoses. Following a diagnosis of CFS from the general practitioner, patients were interviewed by one of us (R.M.M.) to assess if they met current 1994 Centre for Disease Control research criteria for CFS [30]. Of the original 64 patients who provided informed consent to participate in the study, six did not meet the criteria, and five dropped out of the study.
Table I. - Demographic characteristics of research samples

<table>
<thead>
<tr>
<th></th>
<th>CFS</th>
<th>Depressed</th>
<th>Pain</th>
<th>Healthy controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>53</td>
<td>20</td>
<td>30</td>
<td>38</td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>83%</td>
<td>65%</td>
<td>67%</td>
<td>74%</td>
</tr>
<tr>
<td>Mean age (SD)</td>
<td>44.3 (12.5)</td>
<td>38.8 (12.5)</td>
<td>40.3 (10.45)</td>
<td>44.9 (10.8)</td>
</tr>
<tr>
<td>Mean years of illness (SD)</td>
<td>8.6 (8.3)</td>
<td>14.1 (14.1)</td>
<td>4.8 (4.5)</td>
<td></td>
</tr>
</tbody>
</table>

Depressed patients who had no other chronic physical illnesses were recruited through general practitioners, private psychologists, and community mental health centers. Patients who voluntarily provided informed consent were interviewed using the computerized version of the Composite International Diagnostic Interview [31]. Two of the patients interviewed did not meet the study's criteria and one patient chose not to complete the questionnaire. The 20 patients included in the study met current diagnostic criteria for dysthymia or major depression and scored >10 on the Beck Depression Inventory (BDI) [32].

The 30 chronic pain patients included in the study were attending a 4-week outpatient cognitive behavioural pain management program. Patients attending the program were referred from tertiary care and have a chronic pain problem of at least 6-month duration. The pain patients did not complete all the measures included in the study, as they were asked to fill out the CEQ-R in conjunction with a range of measures routinely used to evaluate their pain management program.

The 46 healthy controls were recruited through the university and the community on the basis that they were matched with the patient groups for level of education had no history of either CFS or clinical depression, and no current chronic illnesses. Of these, eight scored >10 on the BDI and were excluded from the study. There were no significant age (F=1.99; df=3, 137; p<0.12) or gender (X2=3.95; p<0.27) differences between the four samples, but the depressed group had a significantly longer mean length of illness when compared with the CFS and pain groups (F=5.96; (elf=2, 96; p<0.004). The descriptive details of the samples are presented in Table I.

Procedure

The CFS, depressed, and healthy control groups completed the CEQ-R in conjunction with other measures to evaluate its reliability and validity. These measures were: (1) the BDI [32], to assess intensity of depression and to provide cut-off criteria for inclusion in subject groups; (2) the Five-Item Mental Health Scale (MHI-5) [33] which measures affective components of psychological well-being and is commonly used to assess psychological adaptation in medically ill populations; (3) the Private Self-Consciousness Scale [34] which is designed to assess intensified self-focusing and has been consistently associated with depression; (4) the Rosenberg Self-Esteem Scale [35]; (5) the Focusing on Symptoms Scale [36], a subscale of the Illness Management Questionnaire, which measures the degree to which patients are aware of their symptoms; (6) live subscales of the Sickness Impact Profile (SIP) [37], including physical mobility, home management, recreation, social interaction, and alertness behaviour, to provide a level of sickness-related dysfunction; and (7) the identity subscale of the Illness Perception Questionnaire [24], which provides a measure of the degree to which patients associate a range of somatic symptoms with their illness.

The illness specific variables were only completed by the depressed and CFS groups. To obtain longitudinal data on the CEQ-R, these two patient groups also completed the measures six months later. Longitudinal data were also obtained from the pain group, who completed the CEQ-R alongside measures routinely used to evaluate the pain management
program. As such, they completed the CEQ-R at the beginning and end of the 4-week program, and at a 3-month follow-up session.

RESULTS

The original CEQ was divided into two subscales on theoretical rather than empirical grounds. To assess whether the CEQ-R does indeed represent two distinct factors, a principal factors extraction with varimax rotation was performed on the 24 items of the CEQ-R collected from all 141 participants. The initial principal factor analysis produced three factors with eigenvalues > 1, which accounted for 60% of the variance. The orthogonal rotation resulted in all 12 of the General CEQ-R items loading onto factor 1. Nine of the Somatic CEQ-R items loaded onto factor 2, whereas three items loaded onto factor 1. These three items all represented errors of personalization and differed from the other nine items in that internal rather than external attributions were made about symptom experiences. In other words, the personalization items (see Appendix) represented situations where the person thought that people around them were negatively affected by the fact that he or she was ill. The other nine items represented situations where symptoms were interpreted as being due to external events which had a negative impact on the person themselves. As such, the three somatic personalization scales were dropped from the CEQ-R. Only two items, both from the General CEQ-R, loaded onto factor 3. As these items had equally high loadings on factor 1, and factor 3 accounted for a small 4.5% of the variance, a second principal factor extraction was conducted, requesting a two-factor solution from the remaining 21 items. The two-factor solution accounting for 56% of the variance was orthogonally rotated, with convergence achieved in three iterations. The factor loadings from the varimax rotation are presented in Table 11, with the item number and name corresponding to the items presented in the Appendix. The two-factor solution clearly distinguished the General CEQ-R from the Somatic

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor 1 (General CEQ-R)</th>
<th>Factor 2 (Somatic CEQ-R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Skiing</td>
<td>0.68</td>
<td>0.37</td>
</tr>
<tr>
<td>2. Office party</td>
<td>0.73</td>
<td>0.32</td>
</tr>
<tr>
<td>3. Raise</td>
<td>0.60</td>
<td>0.35</td>
</tr>
<tr>
<td>4. Painting</td>
<td>0.50</td>
<td>0.29</td>
</tr>
<tr>
<td>5. Improve job</td>
<td>0.70</td>
<td>0.28</td>
</tr>
<tr>
<td>6. Schoolwork</td>
<td>0.54</td>
<td>0.38</td>
</tr>
<tr>
<td>7. Warning</td>
<td>0.72</td>
<td>0.24</td>
</tr>
<tr>
<td>8. Marriage</td>
<td>0.73</td>
<td>0.28</td>
</tr>
<tr>
<td>9. Friendship</td>
<td>0.69</td>
<td>0.14</td>
</tr>
<tr>
<td>10. Report</td>
<td>0.71</td>
<td>0.36</td>
</tr>
<tr>
<td>11. Golf</td>
<td>0.63</td>
<td>0.28</td>
</tr>
<tr>
<td>12. Day care</td>
<td>0.73</td>
<td>0.25</td>
</tr>
<tr>
<td>13. Lie down</td>
<td>0.23</td>
<td><strong>0.59</strong></td>
</tr>
<tr>
<td>14. Walk</td>
<td>0.19</td>
<td><strong>0.63</strong></td>
</tr>
<tr>
<td>15. Playground</td>
<td>0.24</td>
<td><strong>0.70</strong></td>
</tr>
<tr>
<td>16. Terrible day</td>
<td>0.36</td>
<td><strong>0.55</strong></td>
</tr>
<tr>
<td>17. Watch rugby</td>
<td>0.39</td>
<td><strong>0.53</strong></td>
</tr>
<tr>
<td>18. Flu</td>
<td>0.33</td>
<td><strong>0.71</strong></td>
</tr>
<tr>
<td>19. Total collapse</td>
<td>0.20</td>
<td><strong>0.70</strong></td>
</tr>
<tr>
<td>20. Bedridden</td>
<td>0.21</td>
<td><strong>0.65</strong></td>
</tr>
<tr>
<td>21. Swimming</td>
<td>11.27</td>
<td><strong>0.77</strong></td>
</tr>
</tbody>
</table>

Boldface values indicate loadings greater than 0.05.
CEQ-R with items loading 0.5 or above on the relevant subscales. The same factor structure emerged from a subsequent analysis with oblique rotation, but the factor correlation matrix indicated that the factors were correlated 0.62. Thus, empirical analysis confirms that whereas the CEQ-R can be divided into two subscales, these subscales are highly correlated.

**Reliability**

Both separate and combined analyses of the data collected from the four groups confirms that the CEQ-R subscales and total scale had high internal consistency. As shown in Table III, Cronbach alphas for the three patient groups were particularly high. Table IV presents the correlations between the data collected at time 1 and at time 2 which was 6 months later. Overall, the CEQ-R appears to have good test-retest reliability for CFS patients. Values for the CFS group and combined patient groups were substantially higher than those of the depressed group, particularly for the Somatic CEQ-R. This may reflect the fact that test-retest statistics were only available for 17 depressed patients. Alternatively, the CEQ-R may be a more appropriate measure for CFS patients.

**Discriminant validity**

Discriminant validity was assessed by comparing the CEQ-R subscale scores across the four groups. Two separate analyses of covariance (ANCOVA), followed by post hoc Tukey B tests, were conducted with each of the subscales acting as dependent variables, with the four groups as the independent variables and age and gender as the covariates. The results of these analyses are represented graphically in Fig. 1. As the two subscales have different numbers of items, the subscale scores in Fig. 1 have been converted to percentages for ease of comparison. After adjustment by covariates the Somatic CEQ-R varied significantly with group (F=10.27; df=3,137; p<0.001). Post hoc analysis demonstrated that the difference was accounted for by the healthy control group scoring significantly lower than all three patient groups, with no differences evident between the patient groups. After adjustment by covariates the General CEQ-R also demonstrated a highly significant main effect for group (F=8.78; df=3,137; p<0.001). In contrast to the Somatic CEQ-R, post hoc analysis revealed that only the depressed group scored significantly higher than the healthy controls on this subscale. To assess whether length of illness could account for the pattern of results reported by the patient groups, further ANCOVA were conducted on the patient groups alone, with length of illness entered as a covariate. Length of illness did not contribute significantly to either equation and the identical pattern of results was maintained, with all three groups having

<table>
<thead>
<tr>
<th>Subscale</th>
<th>CFS (n = 51)</th>
<th>Depressed (n = 17)</th>
<th>Combined groups (n = 68)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total CEQ-R</td>
<td>0.83&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.35</td>
<td>0.71&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Somatic CEQ-R</td>
<td>0.77</td>
<td>0.27</td>
<td>0.62&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>General CEQ-R</td>
<td>0.84&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.43</td>
<td>0.77&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup>p< 0.01.
comparably high scores on the Somatic CEQ-R, but only the depressed group reporting elevated scores on the General CEQ-R.

We also used paired samples t-tests to investigate the differences between the CEQ-R subscales within each of the groups. Only the depressed group showed no significant difference between the two subscales (t=-1.81; p<0.09), although there was a slight trend toward higher scores on the General CEQ-R. The control group’s General CEQ-R scores were significantly higher than their Somatic CEQ-R scores (t=-2.04; p<0.05). In contrast, scores on the Somatic CEQ-R were significantly greater than those of the General CEQ-R for both the pain (t=3.59; p<0.001) and CFS (t=5.49; p<0.001) groups.

Criterion validity

To evaluate the criterion validity of the CEQ-R, we examined the relationships between the two subscales and measures traditionally associated with depression versus those associated with the experience of somatic symptoms. Because of the small size of the depressed sample only data from the CFS group were used to assess the criterion validity. Table V demonstrates that only the General CEQ-R was related to low self-esteem and intensity of depressive symptoms measured by the BDI. Both subscales were correlated with self focusing and symptom focusing, but unrelated to the actual experience of somatic symptoms. The General CEQ-R demonstrated the strongest association with self focusing, whereas the Somatic CEQ-R was most strongly related to symptom focusing.
Concurrent tend predictive validity

Concurrent validity was assessed by investigating the relationships between the CEQ-R subscales and psychological adaptation and disability in CFS, both at initial assessment and at 6-month follow-up. Investigation of the correlations between distortions in thinking and psychological adaptation measured at time 1 showed that both the Somatic CEQ-R (r=0.28; p<0.05) and the General CEQ-R (r=-0.54; p<0.001) were inversely associated with the MHI-5. Similar correlations were found between the time 2 data. The General CEQ-R measured at time 1 maintained a significant association with psychological adaptation at time 1 (r=0.39; p<0.01), but the correlation between the Somatic CEQ-R and time 2 MHI-5 was no longer significant (r=-0.22; p<0.12). On the other hand, when we investigated the correlation between time 1 MHI-5 scores and the time 2 CEQ subscales, the correlation for the General CEQ-R was r=-0.54(p<0.001)and r=-0.30 (p<0.03) for the Somatic CEQ-R.

The time 1 correlations between the CEQ subscales and the SIP disability score were in a positive direction but were nonsignificant. However, the time 2 data demonstrated a strong positive association between the Somatic CEQ-R and disability (r=0.38; p<0.01), although the correlation between the General CEQ-R and disability remained nonsignificant (r=0.22; p<0.12) The time 1 Somatic CEQ-R was unable to predict disability at time 2 (r=0.17; p<0.23), but disability at time 1 was positively correlated with somatic errors at time 2 (r=0.34; p<0.02). These results suggest that depression and anxiety are related to both subscales of the CEQ-R, although these mood states seem to be more strongly associated with general cognitive errors. On the other hand, disability shows some association with somatic errors, but not general errors.

To get a clearer idea of possible predictive effects of the CEQ-R, we also investigated changes in pain patients' CEQ-R scores at the end of the pain management program and at 3-month follow-up. Data for all three time spans were only available for 20 of the 30 patients. Using a within-subjects repeated measures design we found that there was a significant decrease in the Somatic CEQ-R score over the three measurement periods (F=4.01; df=2,38; p<0.03). However, the General CEQ-R score was unchanged over this time (F=2.10; df=2,38; p<0.12). To ascertain whether the decrease in somatic errors was associated with improvement in the pain group, we performed similar repeated-measures analyses on the Modified Zung Depression Inventory [38] and the Pain Disability Index (PDI) [39], which are completed by the pain patients as part of the pain program evaluation procedure. Both the Zung (F=4.68; df=2,32; p<0.02) and the PDI (F=8.00; df=2,32; p<0.001) scores showed a corresponding decrease over the three time periods.

DISCUSSION

The aim of this study was to generate an empirically valid and reliable measure of cognitive distortion that is brief to administer and applicable to a wide range of illness groups. Lefebvre's [13] EQ was used as the basis of his questionnaire. Factor analysis confirmed that the shortened and revised version of the CEQ could be empirically differentiated into two subscales, one reflecting general errors of thinking typical of depressed patients, and the other, reflecting errors of thinking specific to somatic experiences. However, one quarter of the somatic items included in the original Pain CEQ loaded onto the general rather than the somatic factor and were excluded from the questionnaire. These items all reflected errors of personalization where the individual's experience of symptoms is interpreted to have a negative impact on the others. The remainder of the Somatic CEQ-R represents items where
symptoms have a negative effect on the person themselves. The final CEQ-R consisted of a 9-item Somatic CEQ-R and a 12-item General CEQ-R. Both subscales had good internal reliability across patient groups and sound test-retest reliability.

The CEQ-R was able to differentiate between the groups included in this study. The CFS and chronic pain patients demonstrated an identical pattern with significantly elevated scores on the Somatic CEQ-R, but not on the General CEQ-R, when compared to healthy controls. The depressed patients made equally high numbers of somatic errors when compared with the patient groups, but also made significantly more general errors when compared with all three other groups. It would appear that, while primary depressed patients tend to make cognitive distortions in any situation, patients with illnesses that present in a predominantly somatic fashion make distortions that are quite specific to somatic experiences. As conditions such as CFS and chronic pain have substantial nosological overlap with depression [29], the CEQ-R might be a useful discriminating tool.

The CEQ-R may also be useful in explaining common underlying cognitive mechanisms or structures. Although previous research on chronic pain patients has focused on quantifying pain-specific cognitive distortions [6, 13], our results suggest that pain patients' distortions can be applied to a wider range of everyday somatic symptoms. It would also be interesting to assess if misinterpreting somatic situations rather than general situations is a common underlying feature of other related functional conditions, such as fibromyalgia, multiple chemical sensitivities, and irritable bowel syndrome.

Confirmation that somatic cognitive errors in CFS are not just a feature of depression or severity of symptoms in this illness was obtained by investigating correlations between the Somatic CEQ-R subscales and both depression and somatic relevant variables. The Somatic CEQ-R was unrelated to the BDI, self-esteem, and somatic symptom reports, but was significantly correlated with self and symptom focusing. As such, experiencing somatic symptoms does not necessarily lead to somatic errors of thinking. Instead, the tendency to be overly symptom and/or self focused seems to lead to misinterpretations of somatic experiences. The General CEQ-R in CFS was associated with poor self-esteem, high depression scores, and intensified self focusing, suggesting that cognitive distortions of day-to-day activities are a risk factor or correlate of depression in this condition. Previous research has found that CFS patients have higher self-esteem than depressed patients [23]. The fact that CFS patients tend to make more somatic cognitive distortions than general ones may serve to preserve self-image in the face of a debilitating illness.

Despite the fact that the Somatic CEQ-R is unrelated to diagnostic symptoms of depression in CFS, it is related to affective dimensions of anxiety and depression as well as ongoing disability. Both negative affect and self-reported disability in CFS predicted somatic errors, but not vice versa, suggesting that rather than playing a causative role in this disorder, errors in thinking are state-dependent. However, as the Somatic CEQ-R was positively associated with both disability and negative affect over time, somatic distortions may play a role in maintaining these conditions. The General CEQ-R was unrelated to disability, but maintained a consistent relationship to depression and anxiety.

Both CFS and chronic pain tend to last for many years and identifying factors that maintain these conditions provides useful insights for treatment. Analysis of tile pain patients' progress through the pain management program showed significant decreases in somatic cognitive errors, depression, and disability, but not in general cognitive errors. Altering patients' interpretations of their symptoms appears to be a useful treatment tool. Alternatively, increasing patients' activity levels may assist them to re-evaluate the meaning of their symptoms, which in turn can improve psychological well-being.

Limitations of this study should be noted. First, participants in the CFS and depressed groups were all volunteers, whereas the chronic pain patients were a select group attending a
tertiary pain management clinic, making it difficult to generalize the results to the wider patient populations. However, inclusion into groups was done on clearly identified diagnostic criteria rather than self-report measures, so that from a clinical point of view the patient groups were clearly defined. Second, we did not evaluate cognitive errors in patients with a clearly defined medical condition. It may be that somatic distortions are just a function of physical illness, although the fact that there is no relationship between symptom reports and somatic cognitive errors suggests that this is unlikely. Third, the subject variable ratio for the factor analysis of the CEQ-R was only just sufficient. Further clarification of the factor structure on larger samples is warranted. Fourth, patient numbers in each group were limited, so that within-group analysis may have been unable to detect certain significant correlations. Finally, although we collected data over time, we were unable to assess true causal effects as all the patients had been ill for quite some time.

Despite these methodological limitations, the CEQ-R has demonstrated sound reliability and discriminant validity and is relatively quick to administer. Unlike the CAT, which measures catastrophizing as part of a broader coping scale, the CEQ-R is designed specifically to measure a range of cognitive distortions. Another questionnaire, the Pain Cognition List [40], also incorporates a catastrophizing scale, but as with the CAT certain of the items appear to measure depression-relevant rather than pain-specific cognitions. The CEQ-R distinguishes between somatic distortions, which appear to be most pertinent to patients with chronic pain and CFS, from general depressive cognitions. To our knowledge the CEQ-R is also the only questionnaire which measures distortions relevant to a range of somatic complaints. Further research using the CEQ-R should investigate the role of cognitive errors in well-defined medical conditions to clarify if somatic errors do indeed characterize conditions such as CFS and chronic pain. The relationship between somatic errors and functional impairment needs further clarification with samples and more objective measures of disability. Examining cognitive errors prospectively would also be useful to assess the role of somatic errors in the development of disability.

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APPENDIX: CEQ-R SUBSCALES AND ITEMS

Rating system: (1) “almost exactly like I would think”; (2) “a lot like I would think”; (3) “somewhat like I would think”; (4) “a little like I would think”; (5) “not at all like I would think.”

General CEQ-R

Overgeneralization:
1. Recently a number of your friends are learning to play tennis. You would like to learn, but remember the difficulty you had the time you tried to ski. You think to yourself, “I was useless (it skiing so I doubt if I can learn to play tennis.”
2. YOU have just started a new job), and were obliged to attend the annual office Christmas party. You didn't really know anybody there and had a terrible time. When new neighbours invite you to their house-warming party, you think, “I will have a terrible time, just like at the office party.”
3. On your last job, you had not received a raise even though a co-worker with similar experience had. You are now up for a raise in your present job and think, “I didn't get a raise last time and I probably won't get one now.”
Selective abstraction:
4. Last week you painted the living room and your spouse said it really looked great. When you were cleaning up, you found that you had got paint on the carpet and thought, “Oh no, this wasn't a very good painting job.”
5. You met with your boss today to discuss how you have been doing in your job. (S)he says that you were doing a really good job, but asked you to improve in one small area. You think to yourself, “(S)he says you were doing a really good job, but asked you to improve in one small area. You think to yourself, “(S)he really thinks I am doing a lousy job.”
6. Your 9 year-old son normally does well at school. Last week, he brought back his math homework which he had done incorrectly and was supposed to do over. You think to yourself, “Oh no, now he is having trouble with his schoolwork.”

Catastrophizing:
7. You are a manager in a small business firm. You have to give an employee, who has been doing a terrible job, a severe warning that she is running the risk of losing her job. You have been putting off meeting with her for a few days and think to yourself, “I just know she will resent me giving her the warning and will turn all the other employees against me.”
8. Earlier today, your partner asked to have a serious talk with you after work about some things that were troublesome at home. You have no idea what is going on and you think, “We don't communicate enough. Our marriage is going to fall apart.”
9. You have an argument with a friend. When she doesn't call you as usual during the week, you think, “Our friendship is ruined, and she doesn't want to speak to me again.”

Personalization:
10. You hand in a report to your boss that has taken you 4 hours to write. Your boss, however, doesn't say anything about it. You think to yourself, “(S)he must think I did a lousy job.”
11. You played golf for the first time today with some of your friends who play regularly. Everybody seemed a bit disappointed with their play, and the group seemed a bit subdued on the way home. You thought to yourself “I guess I held the worst hack and spoiled the game for them.”
12. You run a day care center. Today, the mother of a child you have been having difficulties with calls and notifies you that she has quit work and will be withdrawing her child from your program. You think, “She probably thinks I wasn't handling him as well as I should.”

Somatic CEQ-R
Overgeneralization:
13. You and your partner went to a party the other day and you had a bad time because you felt very fuzzy headed and had to ask the host if you could lie down in the bedroom for half an hour. When your partner asks you to go to a party the following weekend, you think to yourself, “I don't want to go because I curt going to rave to lie down again.”
14. A friend has just asked you to go out for a walk. You remembered how very fatigued and sore you felt after playing it game of tennis other day arid you think to yourself, “I guess there is no way I could hold up if I went out fn- a walk with him/her.”
15. You teach at a primary school. The last time it was your turn to stand and watch the children in the playground during lunch break, your muscles felt weak and ached for the rest of the afternoon. You notice that it is your turn again and think, “I have to watch those kids during break, I just know in), body will hurt for the rest of the clay.”
Selective abstraction:
16. You have been feeling very weak and tired of late, but have continued to work. Although you got quite a bit done today, you finished work early because you were feeling particularly exhausted. You think to yourself, “What a terrible clay. It seems like I can't get anything done.”

17. You and your family went to an afternoon rugby/football game. You enjoyed the first half of the match, but then you started to feel tired and your back was aching. You find yourself thinking, “What an awful way to spend an afternoon.”

18. You have just returned to your job, after a sick leave during which you were recovering from yet another bout of flu. You worked hard all afternoon, but didn't finish everything you wanted to. You think to yourself, “Because of these recurring episodes of flu, I can't do my job.”

Catastrophizing:
19. Recently your job has been so demanding that you have worked straight through your lunch hour. As a result you have been feeling increasingly fatigued and have had difficulties concentrating. Driving home from work, you think, “If I don't get some time to relax during the day, I am going to have a total collapse and be unable to work.”

20. You work at a job which requires some lifting and carrying of heavy boxes. The other day, you felt really weak and your muscles felt stiff and sore at the end of the day. Driving home from work, you find yourself thinking, “If this keeps up I won't be able to work or even walk, and might land up permanently bedridden.”

21. Your favourite exercise is swimming. Even though you have been feeling very tired and your muscles feel sore after swimming, your doctor has urged you to keep up your exercise regime. Today when you were having your normal swim, your muscles started to ache before you were finished. You think to yourself, “Pretty soon, I won't be able to swim at all.”

NOTE: Personalization items not included in the final version of the CEQ-R

22. You often feel extremely tired and run down which you feel limits the amount of activity you can do. Sometimes when you notice that your children seem to be in a bad mood, you think to yourself, “The kids wouldn't be so irritable if I was able to play more.”

23. Your boss has just posted the new work schedules and you notice that you will be working a split shift instead of the more strenuous 8-hour straight shift. You think to yourself, “I know I have been given that shift because I am always feeling tired and sick. My boss must think I can't do the job.”

24. You are generally reluctant to go out with friends because you must take frequent rests during the day to avoid getting overtired. Recently, several friends convinced you to go out with them. On the way home, everyone was quiet in the car. You think, “Because of me and my having to rest all the time, no one had a good time.”

REFERENCES


