RESEARCH ARTICLE

Psychological Resilience, Affective Mechanisms and Symptom Burden in a Tertiary-care Sample of Patients with Fibromyalgia

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Abstract

Research demonstrates that patients with fibromyalgia who have higher positive and lower negative affect have lower symptom burden. Affect has been shown to be associated with resilience. This study examined the relationship between affect, resilience and fibromyalgia symptom burden in a clinical sample of patients with fibromyalgia. We hypothesized that (a) positive and negative affect would be associated with fibromyalgia symptom burden; (b) resilience would be associated with positive and negative affect; (c) resilience would be associated with fibromyalgia symptom burden; and (d) the connection between resilience and fibromyalgia symptom burden would be mediated by both positive and negative affect. A sample of 858 patients with fibromyalgia completed questionnaires. Mediation modelling revealed statistically significant direct effects of resilience on fibromyalgia symptom burden ($\beta = -0.10$, $P < 0.001$) and statistically significant indirect effects of resilience on fibromyalgia symptom burden through affect ($\beta = -0.36$, $P < 0.001$), suggesting that both resilience and affect influence fibromyalgia symptom burden. Our results suggest that improving affect through resiliency training could be studied as a modality for improving fibromyalgia symptom burden.

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Keywords
fibromyalgia; resilience; affect; chronic pain

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Fibromyalgia is a chronic pain disorder characterized by widespread pain, fatigue, cognitive difficulties, unrefreshing sleep and poor psychological health (Arnold et al., 2008; Hallberg & Carlsson, 1998; Wolfe et al., 1990). Affect is a key component of psychological health and has been shown to be associated with quality of life, functionality, pain tolerance and resilience in patients with chronic pain (Furlong, Zautra, Puente, Lopez-Lopez, & Valero, 2010; Zautra, Hamilton, & Burke, 1999). Affect can be described as either a state or trait; as a state, it is reflected in an individual's momentary response to events, whereas as a trait, it is reflected in a person's typical emotional disposition (Cohen & Pressman, 2006). It is composed of both positive and negative dimensions, where higher positive affect and lower negative affect have been associated with lower levels of symptom burden in patients with fibromyalgia and other chronic pain disorders (i.e. higher negative affect has been associated with increased symptoms; Dekker, Tola, Aufdemkampe, & Winckers, 1993; Zautra, Fasman, Parish, & Davis, 2007; and higher positive affect has been associated with having fewer symptoms and better functional status; Hassett et al., 2008; Zautra, Smith, Affleck, & Tennen, 2001; Zautra et al., 2007; Zautra, Johnson, & Davis, 2005). Several studies have also shown that average levels of positive affect tend to be lower in patients with fibromyalgia compared with those in patients with other pain conditions (Finan, Zautra, & Davis, 2009; Hassett et al., 2008; Zautra et al., 2007; Zautra et al., 2005; Zautra, Johnson, & Davis, 2005).

Resilience refers to one's ability to deal with stress and adversity (Connor & Davidson, 2003; Evers, Zautra, & Thieme, 2011; Karoly & Ruehlman, 2006) and is influenced by genetic, epigenetic, developmental, neurochemical and psychosocial factors (Wu et al., 2013). A recent review examining psychological factors that impact rheumatic diseases emphasized the importance of resilience and summarized a psychological care approach that would include treatment options that emphasize relevant risk and resilience factors (Evers et al., 2011). Similarly, a study examining the role of resilience in osteoarthritis found that resilience had significant indirect effects on physical functioning through self-efficacy (Wright, Zautra, & Going, 2008). Another study revealed that patients with chronic pain who were more resilient had better coping styles, less pain behaviours and less catastrophizing tendencies in comparison with non-resilient patients with chronic pain (Karoly & Ruehlman, 2006).

It has been suggested that patients with fibromyalgia might have an overall deficit in resilience and that this deficit is closely related to a disordered affect (especially low levels of positive affect) (Karoly & Ruehlman, 2006; Zautra, Johnson, & Davis, 2005). In support of this notion, Zautra, Johnson, et al. (2005) suggested that the lack of ability to sustain positive affect in response to everyday stressors may be one mechanism to explain the low resilience and high fatigue commonly observed in patients with fibromyalgia. Similarly, Hassett et al. (2008) described a group of patients with fibromyalgia who were high in positive affect and low in negative affect and experienced less functional disability and psychiatric comorbidity. Understanding resilience in fibromyalgia, especially affective mechanisms through which it might have its effect, offers an important knowledge base through which interventions might be developed to help patients cultivate greater personal resources to cope, despite the negative impact related to fibromyalgia symptoms (Torma, Houck, Wagnild, Messecar, & Jones, 2013; Tugade & Fredrickson, 2004; Zautra, Fasman, et al., 2005).

The objective of the present study was to examine associations between resilience, affect and fibromyalgia symptom burden in a clinical sample of patients with fibromyalgia and to extend the work of Zautra and colleagues in examining the extent to which not only positive, but also negative, affect acts as a mediator between resilience and fibromyalgia symptom burden. We hypothesized that (a) positive and negative affect would be associated with fibromyalgia symptom burden; (b) resilience would be associated with positive and negative affect; (c) resilience would be associated with fibromyalgia symptom burden; and (d) the connection between resilience and fibromyalgia symptom burden would be mediated by both positive and negative affect. Our hypotheses are depicted as a conceptual model in Figure 1.

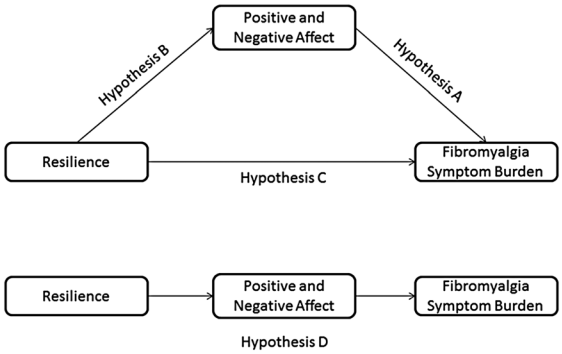

Figure 1. Conceptual model proposing the direct and indirect effect of resilience on fibromyalgia symptom burden through positive and negative affect. Hypothesis D requires that both hypotheses A and B are confirmed and that there is evidence of a statistically significant indirect effect operating through positive and negative affect

Methods

Participants

Surveys were mailed to 1303 randomly selected patients from a fibromyalgia registry established at the Mayo Clinic in Rochester, Minnesota (Whipple et al., 2013). Patients included in this registry had a current diagnosis or history of fibromyalgia in their medical record and agreed to be contacted for future research. Surveys included the Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988), Connor–Davidson Resilience Scale (CD-RISC) (Connor & Davidson, 2003) and the Fibromyalgia Impact Questionnaire Revised (FIQ-R) (Bennett, Bushmakin, Cappelleri, Zlateva, & Sadosky, 2009). The study (IRB# 11-002884) was approved by the Mayo Clinic Institutional Review Board.

Measures

The FIQ-R is a validated 21-item self-report measure that assesses the symptom severity, functional status and overall impact of fibromyalgia (Bennett et al., 2009). Respondents rate items on an 11-point scale, and scores range from 0 to 100. Higher scores indicate more severe symptoms. The total FIQ-R score provides a measure for overall fibromyalgia symptom burden, where a score of 0 to <39 is classified as mild, ≥ 39 to <59 as moderate and ≥ 59 to 100 as severe (Bennett et al., 2009). For this study, we used the total score as the measure of symptom burden related to fibromyalgia. The internal consistency of the FIQ-R for the present study was 0.94.

The CD-RISC is a 10-item validated self-report measure that assesses resilience (Campbell-Sills & Stein, 2007; Connor & Davidson, 2003). The CD-RISC contains items that assess one's ability to adapt to change, see the humorous side of things, not get discouraged in the face of adversity and cope with stress and other

similar attributes. Respondents rate items on a scale from 0 (not true at all) to 4 (true nearly all the time). Scores range from 0 to 40, with higher scores indicating greater resilience. In a community survey of 764 US adults, a mean score of 31.8 ($SD = 5.4$) was obtained for the CD-RISC (Campbell-Sills, Forde, & Stein, 2009). The internal consistency of the CD-RISC 10 for the present study was 0.92.

The Positive and Negative Affect Schedule is a 20-item self-report measure that assesses perceptions of positive and negative affect (Watson et al., 1988). It consists of two 10-item scales: one for positive affect and one for negative affect. Respondents rate single-word items describing positive or negative emotions on a scale from 1 (very slightly or not at all) to 5 (extremely). Scale scores range from 10 to 50, with higher scores indicating higher levels of positive or negative affect. Normal values for positive affect are 31.31 ($SD = 7.65$), and values for negative affect are 16 ($SD = 5.9$) (Crawford & Henry, 2004). In the present study, internal consistency was 0.92 for the positive affect scale and 0.90 for the negative affect scale.

Analysis

Descriptive statistics were computed using JMP software (SAS Institute Inc., 2010). Structural equation modelling (SEM) was used to examine the extent to which resilience predicted positive and negative affect, and in turn, positive and negative affect predicted symptom burden as characterized by the FIQ-R total score. Age, sex and body mass index were controlled for in all SEM analyses. Amos 19 (Arbuckle, 2006, Chicago, IL) was used for SEM analyses, and χ^2, confirmatory fit index and root mean square error of approximation were used as fit indices as recommended by Kline (2011). Amos software provides bias-corrected, bootstrapped confidence intervals for tests of indirect effects. The PROCESS macro for SPSS (IBM Corp., 2012, v21, Armonk, NY) was used to test the significance of each indirect effect through positive and negative affect separately, and the difference in the size of the indirect effect through positive versus negative affect.

Results

Of the 1303 patients contacted, 858 (65.8%) returned completed surveys. Respondents had a mean age of 56.6 (±12.7) years; 90.7% were Caucasian, and 92.2% were female. Means and standard deviations for the FIQ-R, CD-RISC and positive and negative affect were 52.6 (20.7), 25.3 (8.2), 27.6 (8.8) and 20.8 (8.5), respectively. Pearson correlations between CD-RISC and positive affect (0.52), negative affect (−0.55) and FIQ-R (−0.48) were significant and in expected directions ($P < 0.001$) (Table I). SEM analyses revealed a small but significant direct effect for resilience on symptom burden ($\beta = -0.10$, $P < 0.001$). Larger direct effects for resilience were observed on positive ($\beta = 0.50$, $P < 0.001$) and negative affect ($\beta = -0.53$, $P < 0.001$). Both positive ($\beta = -0.29$, $P < 0.001$) and negative ($\beta = 0.40$, $P < 0.001$) affect also had significant direct effects on symptom burden (Figure 2). The indirect effect of resilience on symptom burden acting through the mechanisms of both positive and negative affect was statistically significant ($\beta = -0.36$, $P < 0.001$).

Table I. Correlations between the CD-RISC, positive and negative affect and the FIQ-R

	PA	NA	CD-RISC	FIQ-R total
PA	1.00			
NA	−0.30	1.00		
CD-RISC	0.52	−0.55	1.00	
FIQ-R Total	−0.47	0.55	−0.48	1.00

CD-RISC: Connor–Davidson Resilience Scale; FIQ-R: Fibromyalgia Impact Questionnaire Revised; NA: negative affect; PA: positive affect.

To decompose the overall indirect effect, the PROCESS macro for SPSS was used to test each indirect path individually. This analysis revealed a statistically significant indirect effect for both positive ($\beta = -0.37$, $P < 0.05$) and negative affect ($\beta = -0.54$, $P < 0.05$). Because the indirect effect for negative affect was noticeably larger than that for positive affect, the difference between the indirect effect coefficients was tested statistically. The difference ($\beta = 0.17$, n.s.) was not statistically significant. Hence, both positive and negative affect offer statistically equal indirect mechanisms through which resilience has its connection to symptom burden. Overall, the fit of the model was acceptable ($\chi^2(4) = 5.31$, $P > 0.05$, confirmatory fit index = 1.0, root mean square error of approximation = 0.02). Because the direct effect of resilience was small relative to the indirect effects through positive and negative affect, the necessity of this small but statistically significant path was tested using a nested model and χ^2

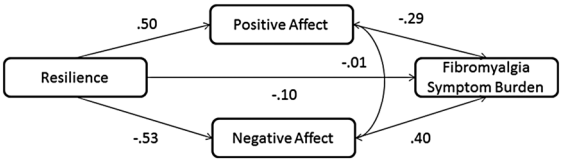

Figure 2. Structural equation modelling model for the direct effect of resilience on fibromyalgia symptom burden and indirect effects of resilience through affect on symptom burden. All shown model coefficients are standardized and p's < 0.001. Covariances between positive and negative affect are not statistically significant. Only significant paths for control variables were specified in the model. These included age and positive affect, beta = 0.14; age and negative affect, beta = −0.13; female sex and positive affect, beta = 0.09; female sex and fibromyalgia symptom burden, beta = 0.07; body mass index and fibromyalgia symptom burden, beta = 0.12. Paths for control variables p's < 0.01

difference test. When the direct effect of resilience on symptom burden was eliminated from the model, the fit of the overall model became statistically worse (difference $\chi^2(1) = 7.93$, $P < 0.01$). Thus, the direct effect of resilience on symptom burden, although small relative to the indirect effects, is a *necessary* component of the model.

Discussion

The present study offers a new model for understanding the association of resilience and fibromyalgia symptom burden. That is, resilience alone may not be of the greatest importance to patients with fibromyalgia in regard to symptom burden; however, resilience may impact fibromyalgia symptom burden through its positive impact on affect. This suggests that resiliency training, by positively impacting affect, may indirectly improve a patient's experience of the burden related to fibromyalgia. Resilient individuals, whether sick or not, typically endure the stresses and strains of daily life. They also experience less social and interpersonal interference and quality-of-life impairment (Downey, 1998; Luthar, Cicchetti, & Becker, 2000). Although this appears to be the case in the present study, the more interesting and powerful effects are related to the connections between resilience, affect and symptom burden. Because our model contains several embedded hypotheses, we will address each in the following paragraphs.

Affect and symptom burden

Our results confirmed the hypothesis that positive and negative affect are significantly associated with fibromyalgia symptom burden, which is consistent with previous reports in fibromyalgia and rheumatoid arthritis (Hassett et al., 2008; Zautra et al., 2001; Zautra et al., 2005; Zautra, Johnson, & Davis, 2005). This suggests that improving affect (decreasing negative affect and enhancing positive affect) may be a way to address the symptom burden of fibromyalgia. Psychological interventions such as cognitive behavioural therapy have typically been used to target high levels of negative affect, which, when enhanced with positive psychological interventions (e.g. forgiveness, gratitude practices and positive visualization practices), may alleviate the deficit in positive affect (Sheldon & Lyubomirsky, 2006; van Koulil et al., 2010) and improve overall symptom burden. Additionally, implementation of these interventions may promote coping and adaptive functioning and allow patients to better control their pain and/or live well despite the pain. Previous studies have compared positive and negative affect scores of patients with fibromyalgia with those of other chronic pain disorders and demonstrated that patients with fibromyalgia have lower levels of positive affect and higher levels of negative affect (Finan et al., 2009; Zautra et al., 2007; Zautra et al., 2005). Scores for negative affect and positive affect in our sample were similar to those reported by others who have evaluated affect in fibromyalgia (Hassett et al., 2008). This affect profile of low positive affect and high negative affect seems to be most typical of patients with fibromyalgia; however, both Giesecke et al. (2003) and Hassett et al. (2008) have described subgroups of patients with a more favourable affective profile in which there is less functional disability and psychiatric comorbidity (i.e. depression), providing evidence that it is possible to live well with fibromyalgia despite experiencing widespread pain. In short, consistent with previous research, higher positive and lower negative affect have beneficial associations with symptom burden in fibromyalgia.

Resilience and affect

Our results also confirmed the second hypothesis that resilience would be associated with affect. This is an important observation. Patients with fibromyalgia lack the affective profile necessary to help them effectively adjust to the challenges of their condition. Unfortunately, affective disturbance can spiral out of control in these patients (Davis, Zautra, & Reich, 2001; Zautra et al., 2005) and develop a positive feedback loop, where affective disturbance drives symptom burden and vice versa (Finan & Zautra, 2010; Hallberg & Carlsson, 1998; Zautra, Johnson, & Davis, 2005). It is crucially important, then, to find a point of intervention that might offer a stable source of support for adaptive affective responding that is independent of the burden imposed by fibromyalgia symptoms. Given the important association of resilience and affect observed in our study and given that resiliency training has demonstrated important physical and psychological benefits in other populations (Arnetz, Nevedal, & Arnold, 2007; Burton, Pakenham, & Brown, 2009; Reivich, Seligman, & McBride, 2011), resiliency training may be a point of intervention for enhancing affect in patients with fibromyalgia.

Resilience and fibromyalgia symptom burden

The third hypothesis that resilience would predict symptom burden was also supported, but this relationship was not as strong as anticipated. Resilience scores in our sample, as assessed by CD-RISC, were lower than those of a sample of the US general population (Campbell-Sills et al., 2009) and demonstrated a significant inverse correlation with fibromyalgia symptoms. Although the direct effects of resilience on fibromyalgia symptom burden were not as strong as expected, analyses demonstrated that this relationship strengthened the overall model of resilience, affect and symptom burden. Our data suggest that an individual's resilient capacity may not directly contribute largely

to their overall experience of fibromyalgia symptomatology, but it should not be disregarded.

Resilience, fibromyalgia symptom burden and affective mediators

The final hypothesis that the relationship between resilience and symptom burden would be mediated by affect was also supported. The most logical explanation of the large, indirect effects through affect might be the independently high correlation of affect with both resilience and symptom burden. Although numerous interventions exist to improve affect (Russell et al., 2008; Thieme, Flor, & Turk, 2006; van Koulil et al., 2010), the results of the present study suggest that enhancing resilience (e.g. improving one's ability to cope with stress and adversity) may be one commonly overlooked but effective method. The present findings suggest the possibility that resilience training might have a direct positive impact on symptom burden in fibromyalgia and, more importantly, such training might equip patients with fibromyalgia with important skills to help them manage their affect and therein find ways to bounce back—perhaps even thrive—despite intense and persistent symptoms.

Conclusions and limitations

As with all studies of this nature, there are limitations that must be considered when interpreting our results. First, the model was derived from cross-sectional data; thus, causal inferences are not appropriate. This relationship should be further tested with interventions that assess changes in resilience and affect and reveal causal effects on symptom burden in fibromyalgia. Despite this limitation, the present work provides a theoretical model to guide interventions and offers correlational evidence that these connections are worthy of further pursuit. Second, our patients were recruited from the same medical centre; therefore, the diversity of the patient sample is limited by the patient population who seek care at a tertiary-care centre. However, it is reassuring that our patients' resilience, positive and negative affect and FIQ-R scores were similar to those reported previously (Hassett et al., 2008). Further work would benefit from large multicentre surveys and clinical trials. Also, our sample was large, and our response was not 100%, which introduces a number of biases, including the possibility that patients who felt better (e.g. had fewer or less severe symptoms, were more resilient and tended to have higher levels of positive affect) would be more likely to participate.

Despite the limitations of this work, there are several strengths that should also be considered. First, we evaluated a very large, well-characterized sample of patients with fibromyalgia, used validated self-report measures and achieved a high response rate. Second, the sample of patients all had a confirmed diagnosis of fibromyalgia in their medical records. Third, our sample was representative of the prevalence of fibromyalgia in men and women, as it has been reported that women are 7–10 times more likely to have fibromyalgia than men (Lindell, Bergman, Petersson, Jacobsson, & Herrstrom, 2000; Wolfe, Ross, Anderson, Russell, & Hebert, 1995). Finally, to our knowledge, this is the first study to describe a model that specifies the relationships between resilience, affect and fibromyalgia.

A good deal of attention has been paid to the role of affect in chronic pain disorders, especially to the role of negative affective states (Dekker et al., 1993; Geisser et al., 2003; Zautra et al., 2001). Unfortunately, less attention has been directed at understanding how positive affective resources can be built and maintained to support better adjustment to conditions such as fibromyalgia. Although positive affect resources are generally accrued from factors including previous experiences of positivity, social and familial connections and personal resources such as capacity for pleasure and finding purpose in life, these can also be cultivated through positive psychological interventions including happiness training, forgiveness and gratitude (Seligman, Steen, Park, & Peterson, 2005; Sheldon & Lyubomirsky, 2006). The present study offers a conceptual model, with supporting empirical evidence, providing the basis for targeted patient education/intervention and clinical trials investigating the extent to which building resilience enhances affect that, in turn, offers better control of symptom burden in fibromyalgia. We hope that the present model and data will offer the substrate for research into ways in which resilience-building interventions might benefit patients with fibromyalgia.

Conflict of interest

The authors have declared that they have no conflict of interest.

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Study data were collected and managed using Research Electronic Data Capture (REDCap) electronic data capture tools hosted at Mayo Clinic (Harris et al., 2009). REDCap is a secure, Web-based application designed to support data capture for research studies, providing (1) an intuitive interface for validated data entry; (2) audit trails for tracking data manipulation and export procedures; (3) automated export procedures for seamless data downloads to common statistical packages; and (4) procedures for importing data from external sources.

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