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The match–mismatch model of emotion processing styles and emotion regulation strategies in fibromyalgia

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ABSTRACT

Objective: Individuals differ in their style of processing emotions (e.g., experiencing affects intensely or being alexithymic) and their strategy of regulating emotions (e.g., expressing or reappraising). A match–mismatch model of emotion processing styles and emotion regulation strategies is proposed and tested. This model specifies that for people high on affect intensity, emotion expression is more adaptive than reappraisal, whereas for alexithymic people, reappraisal is more adaptive than expression. The present study tested this model in 403 women with fibromyalgia (mean age 46.5 ± 12.3 years).
Methods: In a cross-sectional design, we assessed affect intensity (Berkeley Expressivity Questionnaire), alexithymia (Toronto Alexithymia Scale-20), cognitive reappraisal (Emotion Regulation Questionnaire), and emotion expression (Emotional Approach Coping Scales), as well as the impact of fibromyalgia (Fibromyalgia Impact Questionnaire).
Results: Multiple regression analyses with interaction terms indicated that among people high on affect intensity, emotion expression – but not cognitive reappraisal – was associated with less fibromyalgia impact. No support was found for the hypothesis that among alexithymic people, cognitive reappraisal would be more adaptive than emotion expression.
Conclusion: Findings suggest that for women with fibromyalgia who experience their emotions intensely, an emotional disclosure or expression intervention may be beneficial. This hypothesis requires verification in experimental studies.

Introduction

Fibromyalgia is a chronic pain disorder of unknown etiology which is difficult to treat [1]. Negative emotions are commonly experienced in fibromyalgia and may amplify pain [2–4]. This implies that how people with fibromyalgia process and regulate their emotions may be relevant for their pain and adjustment.

Emotion processing styles refer to relatively automatic appraisals of events, which determine the type and strength of emotional experiences [5]. Two emotion processing styles are affect intensity and alexithymia. Affect intensity refers to the strength with which emotions are experienced [5,6], and alexithymia encompasses difficulty identifying and describing emotions [7,8]. *Emotion regulation strategies* refer to the intentional behaviors and thoughts by which people influence or control when and how specific emotions are experienced and expressed [9]. Two common emotion regulation strategies are emotion expression and cognitive reappraisal. Emotion expression is the disclosure or sharing – either verbally or written – of inner feelings [10]. Cognitive reappraisal involves cognitively reconstruing or reinterpreting a potentially emotion-eliciting situation in a way that changes its emotional impact [9].

Another study and our own previous study showed that, compared to women without fibromyalgia, those with fibromyalgia have, on average, different emotion processing styles and emotion regulation strategies: women with fibromyalgia report greater emotional intensity, alexithymic difficulty identifying feelings, and emotion suppression, and lower emotion expression, but no difference in the use of cognitive reappraisal [11,12]. Furthermore, our paper provided a first indication of the need to examine interactions between emotion variables because we found that affect intensity was correlated with more pain and fatigue only in women with deficient emotion processing skills [12]. We used this finding as the starting point in developing the conceptual model that is being tested in the present paper. While emotion regulation strategies such as cognitive reappraisal and emotion expression can be directly therapeutically targeted, it is harder to change emotion processing styles such as

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alexithymia and affect intensity. To derive recommendations for tailoring cognitive therapy and emotion expression to the predominant emotion processing style of the patient, it is important to know which specific emotion regulation strategies best fit specific emotion processing styles (match) and which processing styles and regulation strategies are a poor combination (mismatch). Previous empirical and review papers have provided potential explanations of contradictory findings with regard to the health effects of alexithymia and affect intensity, but these ideas have not been tested. Combining these suggestions with responses to emotional disclosure interventions [e.g., 13] and laboratory studies of emotion [e.g., 14], we propose a match–mismatch model of emotion processing style with emotion regulation strategy (Fig. 1). The proposed model suggests that a person's adjustment depends on the combination of one's automatic emotion processing style and one's use of intentional emotion regulation strategies.

Among people who experience and report heightened affect intensity, a strategy of emotion expression is expected to be beneficial, because the expression of strong emotions will reduce emotional intensity by mechanisms of habituation and, possibly, gaining insight [15–18]. In contrast, cognitive strategies are expected to maintain emotional intensity due to their external focus, which may cause prolonged rumination and worrying, leading to recurrence of unprocessed emotions and physiological hyperreactivity [19,20]. Thus, we hypothesize that for patients who are high on affect intensity, emotion expression (match) leads to better adjustment than cognitive reappraisal (mismatch).

Emotion-oriented strategies, such as emotion expression, require the ability to acknowledge and process emotions — an ability that is deficient in people with alexithymia [e.g., 21]. Eliciting emotions in alexithymic individuals may, therefore, result in an increase in confusion and physiological stress, which has been shown experimentally in a study of women with fibromyalgia in an interview context [22]. Consistent with this, alexithymia is typically associated with poorer outcomes of interventions that encourage emotional disclosure and processing [23,24], but with better outcomes of interventions that are externally focused and use cognitive and behavioral techniques [25–27]. This suggests that among people with alexithymia, cognitive reappraisal (match) is associated with better adjustment than emotion expression (mismatch).

Models of adjustment in fibromyalgia commonly focus on cognitions and behavior. Yet, the observation that emotions may amplify pain [2,3] suggests that emotion processing and regulation are also important. The aim of this study was to examine whether specific combinations of emotion processing styles and emotion regulation strategies are associated with better adjustment to fibromyalgia. We hypothesized that the combination of a high affect intensity processing style with an emotion expression strategy is associated with better adjustment (lower impact of fibromyalgia) than the combination of high affect intensity with cognitive reappraisal. Similarly, we hypothesized that the combination of alexithymia with cognitive reappraisal is associated with better adjustment than the combination of alexithymia with emotion expression. If these hypotheses are verified, it suggests that emotion regulation interventions should be tailored to the emotion processing style of the patient.

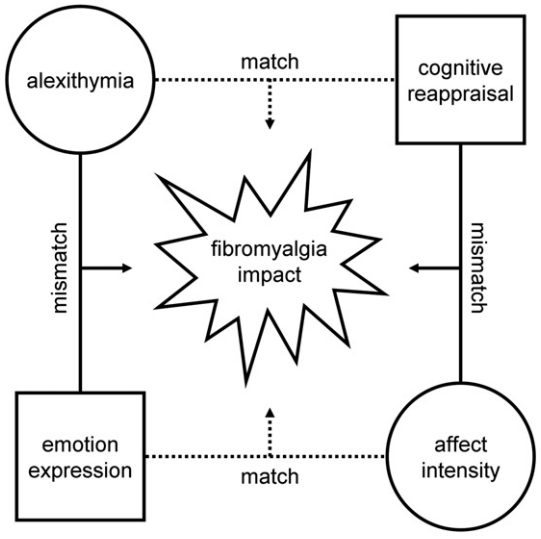

Fig. 1. The match–mismatch model of emotion processing styles and emotion regulation strategies. The solid lines represent a negative association with fibromyalgia impact, the dashed lines represent a positive association with fibromyalgia impact.

Methods

Participants

The data to test the match–mismatch model of emotion processing and regulation were derived from a descriptive study on emotions and emotion regulation on a sample of 403 adult women with fibromyalgia [12]. All patients were classified with fibromyalgia according to the 1990 ACR criteria [28] at any of three hospitals in Utrecht and Almere, The Netherlands. To be able to generalize findings to the population of women with fibromyalgia, male sex was the only exclusion criterion. Participants had a mean age of 46.5 (SD = 12.3) years, a mean duration since diagnosis of 3.5 (SD = 4.4) years, and a mean duration since onset of symptoms of 10.9 (SD = 8.6) years. Seventy-five percent of the participants had a spouse or partner, 11% were single, another 11% divorced, and 3% widowed. Education level was primary school or lower vocational secondary education for 6% of the participants (low), intermediate general secondary education or intermediate vocational education for 77% (middle), and higher vocational or university education for 17% (high).

Measures

Patients completed commonly used, well-validated questionnaires of emotion processing styles, emotion regulation strategies, and fibromyalgia impact. Patients were asked to indicate the way they process and regulate emotions in general. The impact of fibromyalgia was reported for the past week.

Emotion processing styles. Affect intensity, the strength of emotional experiencing, was assessed with the impulse strength scale of the Berkeley Expressivity Questionnaire [29] (e.g., "I experience my emotions very strongly."). The six items are rated from 1 (*strongly disagree*) to 7 (*strongly agree*) and averaged. In the current study, Cronbach's α was .74.

The affective aspects of alexithymia were assessed with the Toronto Alexithymia Scale-20 [7]. The difficulty identifying feelings scale (7 items) measures the inability to distinguish among specific emotions and between emotions and the bodily sensations of emotional arousal (e.g., "I am often confused about what emotion I am feeling."). The difficulty describing feelings scale (5 items) measures the inability to verbalize one's emotions to other people (e.g., "It is difficult for me to find the right words for my feelings."). Items are rated from 1 (*strongly disagree*) to 5 (*strongly agree*) and summed. We did not include the third TAS-20 scale, externally-oriented thinking, in this study because previous research has raised concerns about its reliability and its lack of relationship with the correlates of the two affective components of alexithymia; this has also been found in the Dutch translation of the scale [30,31]. The two affect scales (difficulty identifying and describing feelings) were pooled in a single affective alexithymia scale. Cronbach's α of this scale was .82.

Emotion regulation strategies. Emotion expression was assessed with a 4-item scale of the Emotional Approach Coping Scales [10], which assesses whether emotions are generally expressed in response to a stressful situation (e.g., "I let my feelings come out freely.") on a scale from 1 (*I usually don't do this at all*) to 4 (*I usually do this a lot*). Scores are averaged. Cronbach's α was .85 in the current study.

Cognitive reappraisal was assessed with a 6-item scale of the Emotion Regulation Questionnaire [32], which assesses the ability to achieve or maintain a positive mood (e.g., "When I want to feel less negative emotion [such as sadness or anger], I change what I'm thinking about") on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Scores are averaged. Cronbach's α in the current study was .80.

Impact of fibromyalgia. The Fibromyalgia Impact Questionnaire (FIQ) [33,34] was used to assess the consequences of fibromyalgia with respect to physical impairment, days of paid work missed and job difficulty, pain, fatigue, morning tiredness, stiffness, number of good days last week, anxiety, depression, and current health status. Analyses are typically conducted on total FIQ scores, which range from 0 to 100. People with fibromyalgia have an average total score around 50, with higher scores corresponding to higher impact of fibromyalgia. Reliability and convergent validity (e.g., with the RAND-36) of the Dutch translation of the FIQ have been established [34]. Cronbach's α for the total FIQ score in the current study was .84.

Statistical analyses

Data were screened for deviations from normal distributions; none were noted. All analyses were conducted on datasets without missing values. To deal with sparse missing values on some items of the FIQ, the total score was extrapolated when at least 6 out of 10 subscale scores were available, which resulted in only one missing value for the total FIQ score.

Prior to conducting the regression analyses, zero-order correlations of affect intensity, alexithymia, emotion expression, and cognitive reappraisal with impact of fibromyalgia were calculated. Also, correlations were computed between emotion processing (affect intensity and alexithymia) and emotion regulation (emotion expression and cognitive reappraisal).

As potential covariates, we examined age, marital status, education level, work status, and time since start of symptoms and diagnosis. The total FIQ score was associated with education level; a higher impact was observed in subjects with a lower education level ($F(2,399)=7.90$, $p<.001$). In addition, age was associated with some items of the FIQ. Therefore, both education level and age were added as covariates in all analyses.

To examine whether the matches and mismatches of emotion processing and regulation were associated with fibromyalgia impact, four hierarchical regression analyses were performed. The scores on the emotion processing styles and the emotion regulation strategies were centered before the interaction terms were calculated [35]. In the first block of the regressions, the covariates age and education level were entered. Education level is a nominal variable; thus, two of the three levels were entered as binary variables to the regression equation. In the second block, one of the emotion processing variables (affect intensity or alexithymia) and one of the emotion regulation variables (emotion expression or cognitive reappraisal) were entered. In the third block, the two-way interaction of emotion processing with emotion regulation was entered. To interpret significant interactions, regression lines for individuals low (−1 *SD*) and high (+1 *SD*) on the emotion processing variable were plotted for low (−1 *SD*) and high (+1 *SD*) values of the emotion regulation variable [36]. To probe significant interaction effects, simple slope analyses were conducted. To indicate the magnitude of effects, Cohen's *d* effect sizes were calculated, with values of 0.20, 0.50, and 0.80 representing small, medium, and large effects, respectively [37]. All analyses were performed with SPSS for Windows 16.0.

Results

Correlation analyses

Analyses showed small or trivial correlations of affect intensity with emotion expression, $r(397)=.15$, $p=.004$, and cognitive reappraisal, $r(397)=-.08$, $p=.10$ and of the correlation between alexithymia and cognitive reappraisal, $r(397)=-.08$, $p=.11$. A moderately strong correlation between alexithymia and less emotion expression was observed, $r(397)=-.41$, $p<.001$.

Both affect intensity, $r(397)=.17$, $p<.001$, and alexithymia, $r(397)=.28$, $p<.001$, were associated with a more severe impact of fibromyalgia. Emotion expression was associated with a less severe impact of fibromyalgia, $r(397)=-.18$, $p<.001$. Cognitive reappraisal was not associated with fibromyalgia impact ($p=.87$).

Affect intensity and emotion regulation

The results of the regression analysis modeling the association of affect intensity and emotion expression (match) with impact of fibromyalgia are reported in Table 1. Both affect intensity and emotion expression were associated with fibromyalgia impact (block 2). Over and above these main effects, the impact of fibromyalgia was associated with the interaction of affect intensity and emotion expression, $t(395)=-2.25$, $p=.03$ (block 3). Fig. 2 shows this interaction. A FIQ score in between 39 and 58 is considered average for fibromyalgia, while a FIQ score >59 is considered severe [38]. The impact of fibromyalgia was especially high in patients who were high on affect intensity and low on emotion expression. In case of low affect intensity, the effect size of the difference between individuals with low (−1 *SD*) and high (+1 *SD*) emotion expression was trivial ($d=0.18$) and the simple slope was not significant ($\beta=-.09$, $p=.22$). In case of high affect intensity, the effect size of the difference between individuals with low and high affect intensity was moderate ($d=0.63$) and the simple slope was significant ($\beta=-.31$, $p<.001$).

The impact of fibromyalgia was not associated with the combination of affect intensity and cognitive reappraisal (mismatch), $t(395)=-0.97$, $p=.33$. These results are not shown.

Alexithymia and emotion regulation

The results of the regression analyses modeling the association of alexithymia and cognitive reappraisal (match) with impact of fibromyalgia are reported in Table 2. Alexithymia but not cognitive reappraisal was associated with fibromyalgia impact (block 2). The total impact of fibromyalgia was not associated with the combination of alexithymia and cognitive reappraisal, $t(395)=0.74$, $p=.46$ (block 3). Also, the combination of alexithymia with emotion expression (mismatch) was not associated with the total impact of fibromyalgia, $t(395)=-0.10$, $p=.92$. These results are not shown.

Discussion

We tested a model specifying that combinations of emotion processing styles and emotion regulation strategies would be differentially associated with the impact of fibromyalgia. As hypothesized, we found

Table 1
Association of impact of fibromyalgia with affect intensity and emotion expression (block 2), and the interaction of affect intensity with emotion expression (block 3) controlling for age and education level (block 1)

	b	*SE b*	β		R^2 change
Block 1					.03**
Age	.04	.07	.03		
Low education level	−8.03	3.73	−.20	*	
Middle education level	−14.10	4.13	−.31	**	
Block 2					.07***
Affect intensity	3.03	.73	.20	***	
Emotion expression	−4.44	1.01	−.21	***	
Block 3					.01*
Affect intensity x emotion expression	−2.04	.91	−.11	*	

Education level: 'Low': Primary school or lower vocational secondary education. 'Middle': Intermediate general secondary education or intermediate vocational education. 'High': Higher general secondary education, higher vocational education, pre-university or university education.

* $p<.05$.
** $p<.01$.
*** $p<.001$.

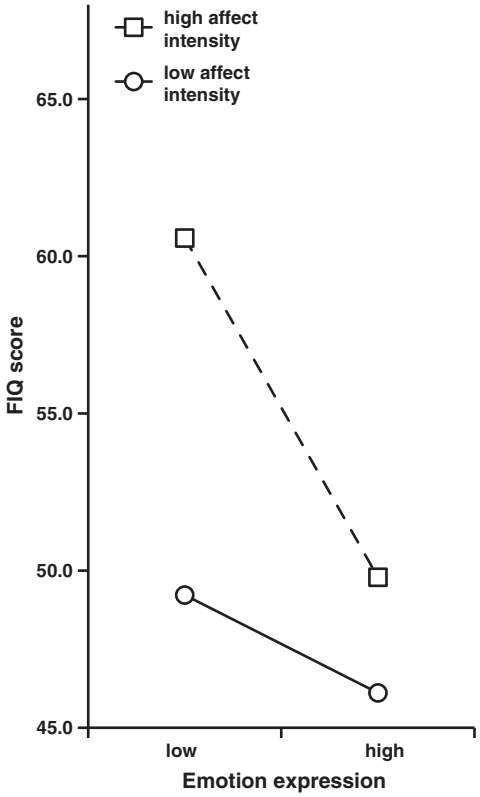

Fig. 2. Total fibromyalgia impact questionnaire (FIQ) score predicted by low (−1 *SD*) vs. high (+1 *SD*) emotion expression and low (−1 *SD*) vs. high (+1 *SD*) affect intensity.

that high affect intensity was associated with a more severe fibromyalgia impact, but less so in patients with high emotion expression. Although alexithymia was associated with a more severe impact, no support was found for the hypothesis that in alexithymic patients, cognitive reappraisal would be a more suitable emotion regulation strategy than emotion expression.

Affect intensity

Before examining the combination of affect intensity and emotion expression, we first observed that high affect intensity and low emotion expression are independently associated with a larger impact of fibromyalgia, which is in agreement with previous findings suggesting that high affect intensity is a general risk factor for maladjustment [12,17,39], and that emotion expression is, on average, healthy [40]. Most importantly, in support of the match–mismatch model, it was shown that experiencing emotions intensely is not necessarily associated with maladaptive outcomes, as long as one expresses one's emotions. However, not expressing strongly felt emotions, which resembles emotion suppression, is a particularly maladaptive combination of emotion processing and regulation.

Insight into moderator variables of emotion expression might enhance the effect of interventions [40]. The finding that patients who are high on affect intensity and low on emotion expression experience a relatively high impact of fibromyalgia, suggests that the subset of women with fibromyalgia who are high on affect intensity but who do not naturally express their emotions might benefit from emotional disclosure interventions. This suggestion is in line with the combined observation of increased affect intensity in women with fibromyalgia [11,12] and clinical experimental research showing that emotional disclosure helps in fibromyalgia [13,41,42]. Possible explanatory mechanisms are a decrease of emotional intensity and physiological arousal [43,44] and an increase in insight [44]. Emotional disclosure in people high on affect intensity who commonly do not use emotion expression may restructure the belief that it is better to inhibit emotions and may help to overcome resistance by learning to express emotions in an effective manner [45]. However, this suggestion that emotional disclosure interventions may especially help women with fibromyalgia who are high on affect intensity and low on emotion expression, requires verification in clinical experimental studies.

Table 2
Association of impact of fibromyalgia with alexithymia and cognitive reappraisal (block 2) and the interaction of alexithymia with cognitive reappraisal (block 3) controlled for age and education level (block 1)

	b	*SE b*	β		R^2 change
Block 1					.03**
Age	.04	.07	.03		
Low education level	−8.03	3.73	−.20	*	
Middle education level	−14.10	4.13	−.31	**	
Block 2					.08***
Alexithymia	.47	.08	.28	***	
Cognitive reappraisal	.21	.72	.01		
Block 3					.001
Alexithymia x cognitive reappraisal	.05	.07	.04		

Education level: 'Low': Primary school or lower vocational secondary education. 'Middle': Intermediate general secondary education or intermediate vocational education. 'High': Higher general secondary education, higher vocational education, pre-university or university education.

* $p<.05$.
** $p<.01$.
*** $p<.001$.

Alexithymia

The commonly observed association between alexithymia and more disease symptoms [46] was replicated in this study. However, although cognitive reappraisal is generally considered to be an adaptive, health-enhancing coping strategy [47–49], we did not find cognitive reappraisal by itself to be associated with better health. Nor was this component of our match–mismatch model hypothesis supported; cognitive reappraisal was not found to moderate the association of alexithymia with fibromyalgia impact.

Null findings regarding cognitive reappraisal have been reported previously with a different definition of appraisal [50], and research using the same measure of reappraisal as in the current study found only a small association between reappraisal and mental health [51]. It might be important to differentiate the targets or timing of reappraisal. For instance, reappraisal can be used with emotions, specific situations, physical discomfort or disability, or general situations such as living with a chronic illness. Also, reappraisal can take place proactively, before emotion response tendencies arise, or reactively [50,52]. It is possible that various types of reappraisal are differentially associated with illness. Perhaps our assessment of cognitive reappraisal was too emotion-focused for people with alexithymia to be able to benefit from it; that is, the questions referred to changing one's thoughts when experiencing emotions, whereas knowing when and which emotions are experienced is one of the main difficulties in alexithymia. Our findings, therefore, should not be generalized to broader interventions that use cognitive reappraisal, such as cognitive-behavioral therapy, which may be beneficial for people with alexithymia [25,26]. Regardless of the specific reasons, the present study did not find evidence to indicate the benefits or drawbacks of cognitive reappraisal in general, nor as a particularly beneficial or harmful strategy for alexithymic people or those high in affect intensity.

Emotion expression was not associated with worse functioning in people with alexithymia. We reasoned that alexithymia would make emotion expression difficult and cause arousal, but this hypothesis was not supported. It appears, therefore, that emotion expression is not necessarily detrimental for people who have difficulty identifying and describing feelings. The finding in our study that neither of the two emotion regulation strategies matched or mismatched to alexithymia is

unfortunate, because no concrete suggestions can be offered on how to diminish alexithymia's maladaptive impact by means of regulating one's emotions.

Limitations

With the large sample size and the use of multiple measures of key constructs, the current study is a firm foundation for further investigation. Our study, however, applies to general, self-perceived, naturally occurring, and habitual emotion processing and regulation. Relationships could be different when emotion processing or regulation in response to fibromyalgia specifically is assessed. Moreover, no causal inferences can be made based on cross-sectional data. Reverse causality is possible. Adjusting to symptoms could influence the more stable emotion processing styles and emotion regulation strategies. Finally, although therapeutically working on emotional disclosure may be especially helpful for women with fibromyalgia who are commonly discouraged from emotional expression, it might also create a disruption in their interpersonal milieu and could increase distress, at least temporarily. Thus, the suggestion from this study that emotion expression may help in women with fibromyalgia who experience adverse effects of high affect intensity warrants verification in clinical, longitudinal, and experimental studies.

Conclusions

We introduced and tested a match–mismatch model of two emotion processing styles and two emotion regulation strategies. We did not find an ideal emotion regulation strategy for alexithymic women with fibromyalgia. However, for women with fibromyalgia who experience their emotions intensely and in whom the impact of fibromyalgia is high, the results indicate that expressing emotions can be beneficial, suggesting that an emotional expression or disclosure intervention may aid adjustment to fibromyalgia.

Conflict of interest

There is no conflict of interest.

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