Preliminary investigation of self-as-context in people with fibromyalgia

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Abstract

Acceptance and commitment therapy (ACT), based on the Psychological Flexibility (PF) model, has been recently applied to fibromyalgia (FM), and appeared effective in improving functioning. However, evidence for some of the processes within the PF model, self-as-context (SAC) in particular, is lacking within this population. The current study validates a measure of SAC, the Self Experiences Questionnaire (SEQ), and preliminarily investigates the role of SAC in relation to functioning in FM. Participants (N=298, 93.3% women) self-reporting a diagnosis of FM were recruited via the Internet and completed an online survey. Measures included pain, pain acceptance and SAC, as processes, and pain interference, work and social adjustment, depression and depression-related interference, as outcomes. Confirmatory factor analysis of the SEQ suggested a bi-factor structure, with a general factor underlying all items and two sub-factors, self-as-distinction and self-as-observer ($\chi^2=46.55$, $p=.06$, comparative fit index (CFI)=.99, Tucker–Lewis Index (TLI)=.99, root mean square error of approximation (RMSEA)=.04). Component factors showed good reliability, Cronbach's $\alpha=.90$, and construct validity, supported by significant Pearson's correlations between SEQ scores, acceptance and outcomes ($r=-.14$ to $-.33$). In multiple regression analyses, SEQ scores significantly predicted pain-related interference ($\beta=-.17$, $p<.05$), work and social adjustment ($\beta=-.14$, $p<.05$) and depression ($\beta=-.21$, $p<.01$), but not depression-related interference, after controlling for pain, but only significantly predicted depression after controlling pain acceptance. These preliminary results show potentially important associations between SAC and functioning in people with FM.

Keywords

Fibromyalgia, psychological flexibility, acceptance and commitment therapy, self-as-context, Self Experiences Questionnaire

Introduction

Fibromyalgia (FM) is a condition primarily characterised by chronic widespread pain, and tenderness.¹ FM is estimated to affect from 0.5% to 5% of adults.^{2–4} Associated symptoms, such as sleep disturbance, fatigue, anxiety and depression are common among people with FM.⁵ It is often observed that people with complex chronic pain struggle with their sense of self, and in holding onto the 'real me'.^{6,7} This appears particularly relevant to people with FM.^{8–10} In addition to

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the ‘loss of self’,¹⁰ many people with FM appear to strongly identify themselves as FM sufferers, which is demonstrated by the emergence of numerous support groups, Internet websites and forums, among other forms of communities for people with FM.¹¹

Cognitive behaviour therapy (CBT) has been used to treat FM with some success. Recent systematic reviews of CBT for FM, however, report small effects for depression at post-treatment, and mixed evidence for effects on sleep.^{12,13} Acceptance and commitment therapy (ACT), a form of CBT, has been recently used to treat FM, and appeared beneficial for a range of outcomes, including psychological and physical functioning.^{14–16}

ACT is based on a model of general functioning and well-being called the Psychological Flexibility (PF) model.¹⁷ The therapeutic aim of ACT is to improve functioning through the improvement of PF. PF is the capacity to be directly, consciously, and fully in contact with the present moment without needless defence, and to carry on or redirect one’s behaviours in the service of one’s goals. The PF model includes a set of core processes: acceptance, cognitive defusion, present-focused awareness, self as context (SAC), values, and committed action. Evidence supports the effectiveness of ACT in improving psychological and physical functioning in chronic pain, and the specific role of these processes in producing the results observed.^{18–22} In FM, ACT also appears to produce benefits through improvements in PF processes.^{14–16} However, evidence for the relationship between processes within the PF model and functioning in FM remains limited, and specifically does not include the relationship between SAC and functioning, partly due to the lack of adequate measurement of this process.

SAC entails an experience of a distinction from one’s psychological experiences and a sense of containing these, or a sense of taking a perspective on one’s psychological experiences. A measure of SAC, the Self Experiences Questionnaire (SEQ), has been recently developed in a mixed chronic pain sample, and appears to be a reliable and valid measure of the self as defined within the PF model.²³ However, the SEQ has not been validated specifically in people with FM.

The current study investigates SAC in people with FM. The specific objectives of the current study were to (1) conduct confirmatory factor analysis for the SEQ to examine if the previously demonstrated factor structure of the SEQ is supported, (2) examine the reliability and validity of the SEQ, and (3) explore the role of SAC in functioning in people with FM independent from pain, and other PF processes. It is hypothesised that scores from the SEQ will show significant associations with all measures of functioning, and that scores from the SEQ will demonstrate unique

associations with measures of functioning, independent from pain and other PF processes.

Methods

Participants

Participants were recruited through online media, including online FM forums, online FM (or pain) support groups, Facebook and Twitter, and provided an Internet link to the online survey simultaneously. Participants clicked on the link to access study information and to participate if they wished to do so. Initially, 347 people responded to invitations. Among these three people did not meet the inclusion criteria, and 14 people did not agree to participate or give consent after reading detailed information about the study. Another 5 people did not provide data on assessment measures. AMOS 20 requires complete data to produce model fit modification indices – only participants providing complete data on the SEQ were included in the analyses. Hence, 298 (91.7%) participants were included in the analyses. In all, 278 participants were (93.3%) women. A total of 281 participants (94.3%) reported a physician diagnosis of FM, and 17 (5.7%) reported a diagnosis without physician verification. Mean age was 44.73 (standard deviation (SD) = 11.04) years old. Endorsed pain sites included back ($n = 275$, 92.3%), neck ($n = 258$, 86.6%), hips ($n = 237$, 79.5%), shoulders ($n = 231$, 77.5%), arms ($n = 181$, 60.7%), lower leg ($n = 188$, 63.1%), upper leg ($n = 179$, 60.1%), abdomen ($n = 178$, 59.7%), chest ($n = 159$, 53.4%) and jaw ($n = 97$, 32.6%), clearly showing a predominant pattern of generalised pain. All participants included in the analyses gave consent for their data to be used for research. The project was granted ethics approval.

Measures

Pain intensity. Participants rated their pain intensity on average over the past week on a standard scale from 0 (no pain) to 10 (extremely intense pain).

Self Experiences Questionnaire. The Self Experiences Questionnaire (SEQ) is a 15-item self-report measure of ‘contextual self’ within the PF model.²³ Contextual self refers to a sense of self that is not based on the content of one’s psychological experiences such as thoughts, feelings and judgements but rather on a sense of taking a perspective on these. Examples of the items from this new measure include ‘Although I can get caught up in my thoughts, emotions and sensations, I can also separate from them’; ‘I can experience a distinction between my experiences and the ‘I’ who notices these experiences’. All items are rated on a

scale from 0, 'never true', to 6 'always true'. This measure was developed in our previous study in which adequate internal consistency and validity for the SEQ were reported. The reliability of the SEQ in the current study was good, $\alpha = .94$.

Chronic Pain Acceptance Questionnaire. The Chronic Pain Acceptance Questionnaire (CPAQ-8) is a 20-item measure of the activity engagement and the willingness or openness components of pain acceptance.²⁴ Items are rated on a 0–6 scale from 'never true' to 'always true'. Higher total scores indicate greater acceptance of pain. An 8-item form with the same factor structure was further validated and was used here.²⁵ The reliability of the CPAQ-8 in the current study was acceptable, $\alpha = .77$.

Brief Pain Inventory. The Brief Pain Inventory (BPI) interference scale is a self-report measure of the impact of pain on daily functioning. In this measure, interference related to pain is rated for seven domains of functioning, including general activity, mood, walking ability, normal work, relations with other people, sleep and enjoyment of life, with one item for each domain. All items of the interference scale are rated on a 0–10 scale from 'does not interfere' to 'completely interferes'. The total score forms a unidimensional scale. It has demonstrated reliability and validity.²⁶ The reliability of the BPI in the current study was good, $\alpha = .88$.

Work and Social Adjustment Scale. The Work and Social Adjustment Scale (WSAS) is a five-item self-report measure of impairment of functioning in terms of work, home management, social leisure, private leisure, and personal or family relationships. All items are rated on a 0–8 scale from 'no impairment' to 'very severe impairment'. The total score forms a unidimensional scale. It is regarded as a reliable and valid measure of impaired functioning.²⁷ The reliability of the WSAS in the current study was good, $\alpha = .88$.

Patient Health Questionnaire (PHQ-9). The Patient Health Questionnaire (PHQ-9) is a 10-item self-report measure of depressive symptoms. The first nine items represent symptoms and are rated on a 0–3 scale from 'not at all' to 'nearly every day'. The total score of these nine items reflects the severity of depression, with higher scores reflecting higher severity of depression. The final item assessing the extent to which depressive symptoms have affected levels of functioning does not form a part of the severity scale, and is rated on a scale of difficulty from 'not difficult at all' to 'extremely difficult'. The PHQ-9 is regarded as a reliable and valid measure of depression severity, and a total score of greater than nine has good diagnostic accuracy as an

indicator of depression.²⁸ The reliability of the PHQ-9 in the current study was good, $\alpha = .85$.

Analysis

Skewness, kurtosis, histograms and Q-Q plots for each variable were examined for normality. Scatter plots for all variables involved in correlation analyses were examined for linearity. The total scores of all measures were considered normally distributed. No obvious non-linear relation was found. Participants who provided data on included measures and those who did not were compared on gender using Chi-square test, and on age using independent-sample t-test and no difference was observed.

After these preliminary analyses, confirmatory analysis was conducted to examine factor structure of the SEQ using AMOS version 20. The factor structure of the SEQ has only been validated in one study.²³ In that study, two moderately correlated factors including one factor reflecting self as distinction (SAD; items 1, 2, 3, 4, 5, 6 and 7), and one factor reflecting self as observer (SAO; items 8, 9, 10, 11, 12, 13, 14 and 15) were identified, together reflecting a contextual sense of self. This two-factor model was evaluated here. Chi-square and several goodness of model fit indices including comparative fit index (CFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA) were reported. Assessment of goodness of fit of these models was based on the following standard structural equation modelling cut-off criteria: CFI > 0.92, TLI > 0.92,²⁹ and RMSEA < 0.08.³⁰

Following the confirmatory factor analysis, the reliabilities of the component factors of the SEQ were examined using Cronbach's α . Construct validity of the component factors was examined using Pearson's correlations with other process variables and outcome variables. Additionally, hierarchical regressions were conducted to examine the associations between SEQ-based variables and functioning, including pain-related interference, work and social adjustment, depression and depression-related interference. A recent comprehensive examination of the structure of the PF model using confirmatory factor analyses in a large chronic pain sample suggested that a general factor reflecting openness explained variance across all measures of PF.³¹ Therefore, we included pain acceptance, a process that explicitly reflects openness in the PF model, as a covariate, alongside background variables, to investigate the relative independent role of the SAC in predicting functioning. Hierarchical regression equations included measures of functioning as dependent variables, and background variables (gender, age) and process variables (pain, pain acceptance, SEQ-based variables) as independent variables. Two hierarchical

Table 1. Goodness of model fit for each model used in confirmatory analyses.

Model		Chi-square	df	p value	CFI	TLI	RMSEA
A	Two factor	596.26	89	<.001	.84	.81	.14
B	Higher-order	596.26	89	<.001	.84	.81	.14
C	Bi-factor (original)	309.92	75	<.001	.93	.90	.10
D	Bi-factor (items 4 and 5 loading onto SAO, items 6 and 7 removed from analysis)	199.09	52	<.001	.94	.92	.10
E	Bi-factor (items 9 and 10 further removed from analysis)	46.55	33	.06	.99	.99	.04

CFI: comparative fit index; TLI: Tucker–Lewis Index; RMSEA: root mean square error of approximation.

regression equations were produced for each outcome variable. In one equation (A), demographic variables were entered into the first block, pain in the second block and SEQ-based variables were entered last. In the other equation (B), demographic variables were entered into the first block, pain in the second block, pain acceptance and SEQ-based variables were simultaneously entered into the last block.

Results

The two-factor model of the SEQ items, including SAD and SAO, was found to have poor fit (Table 1, model A). The correlation between the two factors was significant and large, $r = .82$, $p < .001$. Each item showed a sufficient loading on its respective factor (standardised loading = .71 to .86 for SAD, .57 to .78 for SAO).

Due to the poor model fit of the two-factor model, despite sufficiently differentiated factor loadings on separate factors, and given the high correlation between the two factors, a higher-order model was tested, in which a general factor predicted these two sub-factors (SAD and SAO). The higher-order model was also found to have poor fit (Table 1, Model B). Each item again showed a sufficiently differentiated loading on its respective factor (standardised loading = .71 to .86 for SAD, .57 to .78 for SAO).

A bi-factor model was then tested, in which a general factor predicted each item, and each item loaded onto respective sub-factors (item 1, 2, 3, 4, 5, 6, 7 loaded onto SAD and item 8, 9, 10, 11, 12, 13, 14 loaded onto SAO). This model examined if there was a general factor that could account for the variance among these items and if each factor accounted for unique variance over and above the general factor. The bi-factor model showed marginally good fit (Table 1, Model C). All items showed relatively high loading onto the general factor (standardised loading = .56 to .85), except for item 12 (standardised loading = .34). This indicated that a general factor could account for

the variance among all items. However, items 4, 5, 6 and 7 loaded poorly onto SAD, suggesting that SAD did not account for unique variance over and above the general factor among these items. In addition, modification indices suggested that regressing items 4 and 5 onto SAO could lead to improvement in model fit. Theoretically, items 4 and 5 do reflect elements of SAO, a sense of self above one's thoughts and feelings. Therefore, items 6 and 7 were removed from the analysis, and items 4 and 5 were regressed onto SAO (Model D). Model D showed better model fit compared to the original bi-factor model (Model C). However, the model fit remained unsatisfactory. When Model D was fitted, all items showed significant and high loading onto the general factor (standardised loading = .48 to .83), with item 12 showing significant but relatively lower loading (standardised loading = .30) (factor loadings for Model C and Model D were included in Appendix 1). Modification indices suggested that correlating the measurement errors between items 9 and 10 would lead to improved model fit, suggesting that they correlated above what could be accounted for by the latent factor. Theoretically speaking, these two items both reflect a kind of emotional attachment to one's thoughts and feelings, besides one's perspective on one's thoughts and feelings, which is separation from one's thoughts and feelings (a relationship of distinction), or being above and containing one's thoughts and feelings (a relationship of hierarchy). Therefore, items 9 and 10 were removed from the analysis (Model E). This led to significantly improved model fit. All model fit indices suggested good fit for Model E. Items 1, 2 and 3 regressed significantly onto SAD, suggesting that SAD accounted for unique variance over and above the general factor among these items. Items 4, 5, 8, 11, 12, 13, 14 and 15 regressed significantly onto SAO, suggesting that SAO accounted for unique variance over and above the general factor amongst these items. Table 2 shows loadings of each item onto each factor in model E. Taken together, there appeared to be a general factor underlying all SEQ items, and these

Table 2. Loadings of each item onto each factor in model E (final bi-factor model).

Items	Estimates		
	General	Self as distinction	Self as observer
SEQ5	0.83		0.19
SEQ2	0.80	0.43	
SEQ3	0.78	0.50	
SEQ4	0.76		0.14
SEQ11	0.71		0.30
SEQ1	0.61	0.46	
SEQ8	0.59		0.30
SEQ15	0.58		0.53
SEQ13	0.53		0.68
SEQ14	0.50		0.69
SEQ12	0.30		0.62

two sub-factors (SAD and SAO) each accounted for unique variance among respective sub-sets of items. Omega hierarchical (ω_h)³² was calculated for model E, using the package Omega.³³ ω_h compares the variance of general factor to the total score variance. ω_h values of .75 or higher were suggested as preferred and values of .50 as useful in determining whether a composite score provides unique, reliable variance.³⁴ The ω_h of model E was .74, with 65.4% variance explained by the general factor, 25.6% variance explained by SAD and 9% variance explained by SAO, supporting the general factor explaining variance among all items, while the components of SAO were less well captured by the general factor.

The SAD and SAO factors both showed good internal consistency when treated as separate subscales, Cronbach's $\alpha = .90$ for both sub-scales. Table 3 shows the results from Pearson correlation analyses between SEQ scores (SAD, SAO and total score) and background variables, pain, pain acceptance and all outcome variables. SEQ scores did not show particularly significant correlations with any background variables, and the correlation between SAD and age was small ($r = .13$). SEQ scores showed significant correlations with all process variables and outcome variables in the hypothesised directions, with small to medium effect sizes ($|r| = .13$ to $.33$), except for pain which did not correlate with SAO to a statistically significant level. Overall, the validity of each component factors of the SEQ was supported. In general, higher levels of SEQ scores correlated with better functioning.

Table 4 shows the results of regression analyses. None of the background variables explained significant variance in any of the equations except for age which explained significant variance in the equations for work and social adjustment, $\beta = .15$, $p < .001$ (Equation A) and $\beta = .14$, $p < .01$ (Equation B), and gender which

explained significant variance in the equation (Equation A) for depression-related interference, $\beta = -.14$, $p < .01$. Pain explained significant incremental variance in all equations, $\beta = .26$ to $.41$, all $p < .001$. Pain acceptance also explained significant incremental variance in all equations, $\beta = -.29$ to $-.50$, all $p < .001$. SEQ scores explained significant incremental variances, independently from pain (Equation A); in the equation for pain interference, $\beta = -.17$, $p < .05$; the equation for work and social adjustment, $\beta = -.14$, $p < .05$; and the equation for depression, $\beta = -.21$, $p < .01$, but not in the equation for depression-related interference. When pain acceptance was entered into the equations (Equation B), SEQ scores no longer explained significant incremental variance in any of the equations, except for the equation for depression, $\beta = -.16$, $p < .05$. Pain acceptance was the strongest predictor of all outcomes among pain, pain acceptance and SEQ scores. SAC, as reflected in scores from the SEQ, better predicted depression as compared to other outcomes.

Discussion

The current study provides support for the validity of the SEQ, a measure of self conceptualised within the PF model, and investigates SAC in people with FM. A bi-factor model, in which a general factor underlying all SEQ items and two sub-factors (SAD and SAO) accounted for unique variance over and above the general factor, produced good model fit for data from the SEQ. Both component factors showed good reliability and construct validity. As expected, SEQ scores predicted pain interference, work and social adjustment, and depression, but not depression-related interference, when considered independently from pain. However, these scores did not predict any outcome variables independently from pain acceptance, except for depression.

In the current study, both SAC and pain acceptance correlated with functioning, the latter more strongly so. The results here are in line with findings from previous studies. In previous research in FM, only one similarly designed observational study investigated a PF process, pain acceptance and significant correlations were observed between pain acceptance and a range of measures of psychological and physical functioning with small to medium effect sizes ($r = .25$ to $.42$).³⁵ These results also resonate with evidence from heterogeneous chronic pain samples, where positive associations and a mediating role of pain acceptance have been observed in functioning.^{36–38} Hence, as with other chronic pain conditions, active engagement in meaningful activities without struggling with pain-related sensations, thoughts and feelings appears potentially beneficial for the wellbeing of people with FM.

Table 3. Correlations between SEQ scores and background variables, process variables and outcome variables.

	Age	Gender	Pain	Pain acceptance	Pain-related interference	Work and social adjustment	Depression	Depression-related interference
SAD	0.13*	0.06	-0.15**	0.30***	-0.27***	-0.22***	-0.33***	-.19**
SAO	0.09	0.02	-0.11	0.27***	-0.22***	-0.22***	-0.27***	-.14*
SEQ Total	.11	.03	-.13*	.30***	-.26***	-.24***	-.31***	-.17**

SAD: self as distinction, SAO: self as observer, SEQ: Self Experiences Questionnaire.

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

Table 4. Hierarchical regressions with measures of functioning as dependent variables.

Equation	Block	Predictor	Adjusted R ²	ΔR^2	β
Pain interference (BPI)					
A	1	Pain	.19	.19***	.41***
	2	SAD	.23	.05***	-.17*
		SAO			-.08
B	1	Pain	.19	.19***	.31***
	2	Pain acceptance	.40	.21***	-.44***
		SAD			-.08
		SAO			-.02
Work and social adjustment (WSAS)					
A	1	Age	.02	.03**	.15***
	2	Pain	.19	.17***	.38***
	3	SAD	.23	.04***	-.09
		SAO			-.14*
B	1	Age	.02	.03**	.14**
	2	Pain	.19	.17***	.27***
	3	Pain acceptance	.44	.26***	-.50***
		SAD			.01
		SAO			-.08
Depression (PHQ-9)					
A	1	Pain	.16	.15***	.34***
	2	SAD	.23	.08***	-.21**
		SAO			-.10
B	1	Pain	.16	.15***	.28***
	2	Pain acceptance	.30	.14***	-.29***
		SAD			-.16*
		SAO			-.06
Depression-related interference (Final item from PHQ)					
A	1	Gender	.03	.03*	-.14**
	2	Pain	.15	.13***	.34***
	3	SAD	.16	.02	-.11
		SAO			-.04
B	1	Pain	.15	.13***	.26***
	2	Pain acceptance	.27	.12***	-.36***
		SAD			-.04
		SAO			.01

SAD: self as distinction, SAO: self as observer; PHQ-9: Patient Health Questionnaire; BPI: Brief Pain Inventory.

Demographic variables that did not contribute significantly to the variance explained in the models are not included here.

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

Measures of PF have also appeared in randomised controlled trials (RCTs) of ACT for FM. Luciano and colleagues showed a role of pain acceptance in a trial of

ACT.¹⁴ In two others, a measure of psychological inflexibility was used.^{15,16} Each of these showed an effect of ACT-related treatments on the key processes

assessed. In one of these, significant associations were observed between changes in psychological inflexibility and changes in pain, pain disability and depression.¹⁶ This evidence along with findings from the current study suggest a beneficial role of PF, and specific PF-related processes, in functioning and wellbeing of people with FM.

It is notable that SAC showed moderate correlation with depression, and explained significant and incremental variance in depression, independently from pain acceptance. This relation between SAC and depression indicated a potentially beneficial role of SAC in emotional functioning, and perhaps a potential indirect impact on other aspects of daily functioning via depression. The finding here is in line with results from the investigation of related processes. Evidence suggests positive associations between rumination ('entangled with one's thoughts and feelings') and depression,³⁹⁻⁴² including studies in chronic pain samples,⁴⁰ which also indicate the beneficial role of 'distancing' from one's psychological experiences in depression.

The confirmatory factor analysis did not verify the original factor structure of the SEQ, and components of self as observer were not well captured by the general factor. On the other hand, the bi-factor model including a general factor underlying all items, and two separate dimensions (SAD and SAO) above the general factor, produced good model fit. This factor structure is consistent with the theoretical model underlying the SEQ. As the model suggested, the contextual self generally involves 'distancing' from one's thoughts and feelings, with SAD reflecting a distinction from one's thoughts and feelings, and SAO reflecting a kind of hierarchical relations to these (i.e. 'bigger than' or 'containing' one's thoughts and feelings).^{43,44} In addition, to act with a quality of SAD and SAO requires one's ability to be aware of ongoing events, namely self as process, which is another component of self as defined within the functional contextual approach connected with PF and ACT. In fact, in the study where the SEQ was developed,²³ the two sub-factors SAD and SAO showed significant moderate correlation, which could suggest overlap or common underlying processes between the two sub-factors, processes like awareness and a general sense of perspective. Again, the inter-related nature of these elements of the self, and perhaps the challenge of reporting them, may underlie the difficulty in delineating and producing definitive facets of the model of self in the data. Further testing, refinement or even expansion of items may lead to improvements in data in the future. Nevertheless, although the original factor structure was not verified, the bi-factor model suggested here appears theoretically consistent.

This study did not show a unique role of SAC in predicting functioning independently from pain

acceptance, except for depression. Indeed, the PF model is conceptualised around a set of core processes of PF that are highly inter-related.^{45,31} In addition, a comprehensive examination of the structure of the PF model, suggested a general factor reflecting openness explaining variance across all measures of PF.³¹ Therefore, the inclusion of pain acceptance, a process explicitly addressing openness, and perhaps the most general aspect of PF, may partial out the variance explained by SAC, thus limiting the power of SEQ scores in predicting functioning. Alternatively, the lack of power for predicting functioning may be due to some limit in precision or reliability in the measurement of SAC by self-report. As suggested in the validation study of the SEQ,²³ SAC is a counter-intuitive process that people do not easily or naturally report with respect to their own behaviour and experiences. Perhaps training is needed for a more accurate report of SAC. Further investigations of self as conceptualised in the PF model may also include behavioural measurement alongside the SEQ to better capture SAC and to further validate or develop the self-report measure. We believe an important small step is made here and that more steps are needed.

As a preliminary Internet-delivered investigation, the study naturally has its limitations. First, participants were recruited online through social media. This allows little control over the process of recruitment and little to no ability to verify either diagnosis or other participant responses. This type of recruitment required that the survey remains very brief to retain participation. This is also a selective recruitment process, and generality of these results to a wider population remains to be demonstrated. As a preliminary investigation, we did not comprehensively measure PF processes, but focused on two processes, which means our examination of the PF model is incomplete. As the data gathered were very focused, our ability to conduct analyses of different sub-groups was also limited. Of course, previous studies do show a limited role of background differences in similar analyses and the role of PF facets appears rather generally applicable,^{46,23} which argues against the need to assess and extensively analyse individual background differences. An additional caveat is that the variance that SAC explained in the equations was small.

Obviously, the cross-sectional design of the study limits the causal inferences that can be made here. The relationships we observed between process variables and outcomes are only correlational and do not provide the basis to identify the source or direction of influence. Studies with longitudinal and experimental designs are needed to understand the impact of these processes on functioning and wellbeing over time among people with FM.

In summary, this preliminary investigation supports the validity of a measure of SAC, the SEQ, with a factor structure that is theoretically consistent. It also showed associations between SAC and daily functioning in people with FM. This is the first study to address SAC in a sample of people with FM. In particular, the demonstrated role of this process in depression is potentially important. More comprehensive investigation of the PF model in FM is suggested. The PF model, with its unique inclusion of a process related to the sense of self, may help direct these further investigations into some of the particularly thorny psychosocial problems that impact on the daily life of people with FM.

Conflict of interest

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Appendix 1. Loadings of each item onto each factor in model C and model D (bi-factor models).

	Items	Estimates		
		General	Self as distinction	Self as observer
Model C	SEQ6	0.85	-0.12	
	SEQ7	0.81	-0.09	
	SEQ2	0.81	0.42	
	SEQ5	0.80	0.02	
	SEQ3	0.80	0.44	
	SEQ10	0.76		0.11
	SEQ11	0.73		0.61
	SEQ4	0.72	0.04	
	SEQ8	0.66		0.22
	SEQ1	0.65	0.40	
	SEQ9	0.63		0.15
	SEQ15	0.61		0.48
	SEQ13	0.60		0.61
	SEQ14	0.56		0.64
	SEQ12	0.34		0.24
Model D	SEQ2	0.83	0.37	
	SEQ10	0.81		0.12
	SEQ3	0.80	0.48	
	SEQ5	0.74		0.28
	SEQ11	0.72		0.31
	SEQ1	0.68	0.34	
	SEQ4	0.68		0.22
	SEQ9	0.68		0.13
	SEQ8	0.62		0.30
	SEQ15	0.56		0.56
	SEQ13	0.51		0.69
	SEQ14	0.48		0.71
	SEQ12	0.30		0.61