



**Utrecht University**

**Psychological Flexibility in the Framework of Emotion Regulation Systems in  
the Fibromyalgia population**

Isabel Dahmen (1303856)

Supervisor: Rinie Geenen

Faculty of Social and Behavioural Sciences, Utrecht University

MSc Clinical Psychology

Master's thesis

Course code: 201500819

July 31, 2021

## Abstract

The aim of this study was to explore Psychological flexibility (PF) as a potential buffer in fibromyalgia. A questionnaire was developed guided by Gilbert's theory of emotion regulation where participants had to rate the importance of items describing threats, soothers and drives. It was hypothesised that dimensions fitting the concept of PF would arise and a threat dimension that represents mental distress. Further, it was hypothesised that PF would act as a buffer between symptom severity and emotional well-being and when PF was high and mental distress was high, PF would also act as a buffer against reduced emotional well-being. 402 individuals that self-reported to have fibromyalgia completed all measurements. Indeed, a threat dimension describing mental distress was found and also three dimensions that fitted the concept of PF, that were labelled general PF, soother PF and drive PF. General PF indeed was indicated to act as a buffer between symptom severity and emotional well-being and between mental distress and emotional well-being. Soother PF indicated to act as a buffer only when symptom severity was high and as a buffer between mental distress and emotional well-being. The study highlights the importance of PF for emotional well-being of individuals with fibromyalgia, especially when symptom severity or mental distress is high. It also provides a quantitative measurement for Gilbert's theory and refined the conceptualization of PF by assessment of soother and drive dimensions of PF. Research should examine in prospective research which PF components are relevant for fibromyalgia in improving well-being.

## **Psychological Flexibility in the Framework of Emotion Regulation Systems in the Fibromyalgia population**

Fibromyalgia (FM) is a disorder defined by a chronic widespread pain in muscles and skeleton, an abnormal amount of pain sensitivity, and includes symptoms such as fatigue, cognitive disturbance and difficulty sleeping. Because of its somatic characteristics, FM cannot be explained from a medical perspective alone, but a biopsychosocial perspective is needed to explain the symptomatology of the disorder. It has been suggested that psychological distress, for example catastrophizing and social distress, like experiencing recurrent childhood trauma may play a role in developing FM (Albrecht & Rice, 2016; Pulido-Martos et al., 2020; Winfield, 2001). From a neurological perspective; environmental experiences can produce structural and functional changes in the nervous system, which in turn again has effect on cognitive and affective processes as well as the body's homeostasis (Albrecht & Rice, 2016; Littlejohn & Guymer, 2018). Indeed, neurological dysfunctions in FM have been correlated with a higher sensitivity to pain reflected in brain areas that modulate the attention, anticipation and perceptual aspects of pain (Adams & Turk, 2015; Pinto et al., 2020). Together, physical and psychological determinants have been suggested to form core pathways that predict severity and have shown to be interconnected, emotional distress has physiological effects and leads to over activation of the CNS, making FM a central sensitivity syndrome (CSS) (Littlejohn & Guymer, 2018; Pinto et al., 2020; Pulido-Martos et al., 2020; Winfield, 2001). When studying psychological determinants, it was shown that psychological resilience is negatively correlated with general FM severity (Pinto et al., 2020). Importantly, the appraisal and regulation of emotions may affect pain processing, FM patients are often found to be worse copers with distress, suggesting that to a certain degree emotion regulation is impaired. For example, emotional avoidance strategies are used more often by FM individuals (Kashdan & Rottenberg, 2010; Papi, 2020; van Middendorp et al., 2008). Due to its complexity FM has shown to be difficult to treat, however some psychological interventions that target emotional and self-regulation have been effective in reducing severity and to manage pain better (Pinto et al., 2020). Therefore,

to improve treatment and to develop a more concise model, it is necessary to explore how emotion regulation plays a role in the FM.

Pinto et al. (2020) suggested that the emotion regulation theory of Gilbert might be able to explain how impairment develops and gives rise to some FM symptoms. A good indicator is that this theory integrates neurological, psychological and social perspectives which is necessary to understand somatization (Gilbert, 2014). It describes three emotion regulation systems, the *threat, soother and drive system* that arose throughout evolution with the function to synchronize attention, cognition and behaviour to attain a desired outcome. According to the theory, each system relates to the function of a set of emotions that provide information that help to orientate towards that current goal and further also regulate each other, maintaining a natural homeostasis. The *threat* system helps to detect and respond to threat situations and affiliate protection seeking behaviour functioning with the emotions of anger, anxiety and disgust. Threats that activate this system can be external stressors, arising from sensorial or social events but also internal like aversive emotions or intrusive thoughts (Albrecht & Rice, 2016). The *drive* system relates to activating emotions that help to obtain rewards and skills, so to seek out and acquire resources that affiliate well-being and help to reach valued goals. The *soothing* system is linked to emotions producing feelings of calmness, safety and content and enables to reach a resting state to soothe and recharge. It has been correlated with affiliation, and compassion for self and others and affiliation of well-being. There are different ways the activation of this system can be induced for example through mindfulness, therefore this system is often targeted in therapy, teaching patients self-soothing techniques (Gilbert, 2014; Papi, 2020). It is theorized that when the systems are out of balance the individual becomes stressed.

Pinto et al. (2020) hypothesize that FM is caused by a hyperactive threat system, a hypoactive soothing system and an imbalance in the drive system which switches between a hyper and hypoactive state. Although this approach seems promising, there have been no known studies that directly tested Gilbert's theory as a framework. Therefore, for the current

study a questionnaire was developed, with items that quantified drives, soothers and threats to be tested in the FM population. These items that may affect symptoms according to people with persistent somatic symptoms were derived from an, yet unpublished online study (FERB 19-219) and concept mapping study (FERB 19-274) at Utrecht University. These items may be used to provide empirical substantiation of Gilbert's theory in the FM population.

More specifically, the questionnaire can be used to study how perceived threats, drives and soothers relate to symptom severity and emotional well-being. Research has already provided us with psychological components that may be represented when deriving dimensions (Pinto et al., 2020). Specifically, psychological flexibility (PF), a component of psychological resilience has been related to FM symptomatology and likely contributes to daily well-being (Kashdan & Rottenberg, 2010), findings showed that "flexibility has been associated with more adaptive functioning, better mental and physical health, life satisfaction and positive affect while it reduces anxiety and somatization" (Leonidou et al., 2019). PF is defined as the ability to change behaviour and effectively adapt mental resources according to situational demands, so to arrange needs in order to pursue goals which are in line with ones values and to consciously immerse in the present, while being accepting and non-judging of the inner mental experience (Hayes et al., 2006; Kashdan & Rottenberg, 2010; Leonidou et al., 2019; Vowles et al., 2014). PF is likely to be reflected in a dimension of the questionnaire because both theories have similar definitions, describing that regulation of different emotions is relevant to adapt behaviour to situational demands to reach desired, valued outcomes (McCracken & Morley, 2014). In Gilbert's theory depending on the interaction of internal and external events, the fitting emotion regulation system is activated to produce behaviour, similarly, the PF theory states direct environmental experience interacts with inner experience which can be effectively regulated according to the valued output (Doorley et al., 2020; McCracken, 2013). While the threats in the questionnaire rather describe difficulties that need to be coped with, the soother and drive items describe different ways of regulating. They describe direct behaviours but also internal motivations and valued

outcomes, so PF as ability is rather represented in the latter. Therefore, an expectation is that a dimension that fits with the concept of PF will arise from the items evaluated in this study.

Moreover, there are good reasons why psychological flexibility should be studied more extensively in fibromyalgia. PF means being compliant with difficult experiences in case of where adjustment attempts are unsuccessful or even maladaptive, prioritising responses that help to enable a more full, free and vital living. Importantly, PF is often observed to be low in the chronic pain population (Vowles et al., 2014). Acceptance and Commitment Therapy teaches patients to increase their PF, so learning to develop flexible and persistent pattern of behaviour that is value directed, and to stay aware of the experience of pain and discomfort, instead of trying to control, avoid and reduce pain (Marshall & Brockman, 2016; Vowles et al., 2014). In a study examining the mediation of treatment effects on life satisfaction and disability, pain, emotional distress, fear of movement and self-efficacy did not mediate the outcomes, but PF did (McCracken & Vowles, 2014). Furthermore, positive correlations between PF and daily engagement in pain patients were found and to be associated with lower symptom severity (Kashdan & Rottenberg, 2010). That suggests that in a disorder like FM, PF is a relevant skill to learn (Adams & Turk, 2015)

Items in a PF like dimension in the framework of Gilbert's theory can give more concrete examples that can be studied in the future. Importantly, looking at PF like dimensions derived from soothers and drives together and separately, the questionnaire provides insight in how they correlate with symptom severity and emotional well-being in the FM population. More specifically, since PF has been correlated with many positive outcomes, participants who have higher PF ability likely show better outcomes on emotional well-being (Marshall & Brockman, 2016). Therefore, they might value drive or soothing strategies belonging to a PF like dimension higher. Therefore, PF would reduce the impact of symptoms on emotional well-being and act as a buffer. Supporting this, one other study showed that PF buffers from the negative impact of somatization symptoms on QoL in somatic disorders and another one

suggested that the impact of chronic pain is reduced by PF (Leonidou et al., 2019; McCracken & Velleman, 2010). Conclusively, it is to be expected that a PF dimension will act as a buffer between symptom severity and well-being, so that when PF ability is high, emotional well-being will be higher too.

Further, the questionnaire enables to explore how arising threat dimensions interact with other variables, specifically how perception of threats and PF ability impact emotional well-being. This is relevant to study because perception of symptoms is suggested to play a role in FM symptoms; they often increase with stress levels. FM has also been linked to higher negative affect and its intensity is positively associated with increased pain intensity, physical and mental strain and the impact of FM on QoL (Galvez-Sánchez et al., 2019). Regarding that, people with somatic complaints often avoid valued activities, because they perceive them to potentially make their symptoms worse (Adams & Turk, 2015; Malin & Littlejohn, 2016). Moreover, previous studies showed increased emotional-avoidance strategy use in FM and that these strategies correlate highly with more mental distress (van Middendorp et al., 2008). It was also found that individuals with FM show problems with differentiating emotion from bodily sensations (Leonidou et al., 2019). Importantly, psychological inflexibility has been positively associated with avoidant coping (Adams & Turk, 2015). Regarding coping with negative affect states, attempts to avoid pain and emotions make it more likely that symptoms will perpetuate, together with remaining hypervigilant about potential pain, amplifying pain sensitivity, as described in the fear-avoidance model for chronic pain (Adams & Turk, 2015; McCracken & Morley, 2014). That suggests, difficulty regulating emotions makes psychologically experienced distress and negative affect states a threat and also reduces emotional wellbeing, that is, when the importance of threats that represent emotional or psychological distress is high, and PF is low, emotional well-being is assumed to be lower, while in case mental distress is high and PF ability is high, PF is assumed to act as a buffer between mental distress and emotional well-being.

Thus the aim of this study is to examine dimensions that fit the concept of PF, and how they correlate with symptom severity and emotional well-being. Also, how PF dimensions correlate with a threat dimension that represents psychologically and emotionally experienced distress and emotional well-being will be explored. Specifically, three hypotheses are tested:

1. There will be one or more dimensions arising that have PF like characteristics.
2. PF will act as a buffer between symptom severity and emotional well-being.
3. When perceived threat severity of threats that represent mental distress is high, and PF is high, PF will act as a buffer between mental distress and emotional well-being.

## **Methods**

### **Design and Procedure**

The study was granted approval by the Ethics Committee of the Faculty of Social and Behavioural Sciences of Utrecht University for the number 20-0295 with no objection to the execution of the research project. The study follows a cross-sectional and observational design. The data was collected via an online questionnaire using Qualtrix and was completely anonymous. Participants were acquired through social media platforms as well as by posting a recruitment text on the internet pages of patient associations. Specifically, participants that were older than 18 and from the general population that have chronic pain, fatigue and other persistent physical symptoms were sought out, which was indicated by self-report. A full information letter, informed consent, and the questionnaire were provided after clicking on the link.

### **Participants**

First, the online survey collected basic demographic variables that had the potential to be used as covariates. That included, gender, age, education level, relationship status, and who diagnosed them. Furthermore, participants reported which disorder they have and indicated

any other diseases they might have. The data used in this study consists of cross-sectional assessment of individuals with fibromyalgia. From the 538 people with fibromyalgia who started the study, 402 completed all measures, and were used in the analysis. Table 1 shows a summary of the demographic characteristics of the sample. Most participants were female (94.5%) and had an average age of 41-60 (range 18-81). Education levels were categorized in low, middle and high, the type of institutes included in these levels can be found at the bottom of the table. Almost half of the sample completed a middle level education, while the other half consisted mostly of people completing high education and a few who had low or other education. Lastly, three quarters of the sample stated to be in a relationship and one quarter was single.

**Table 1.** Demographic characteristics of individuals with fibromyalgia ( $n=402$ )

Characteristics	
Gender, $n$ (%)	
female	380 (94.5)
male	21 (5.2)
other	1 (0.2)
Mean age in years (min.-max.)	41 -60 (18-81) ( $SD=1.2$ )
Education, $n$ (%) <sup>a</sup>	
Lower education	36 (9)
Middle education	193 (48.1)
Higher education	164 (40.8)
Other	9 (2.2)
Relationship Status, $n$ (%)	
Single	66 (16.4)
In a relationship	299 (74.2)
Divorced	23 (5.7)
Widowed	13 (3.2)
Other	6 (1.4)

a. Education: "Lower education" refers to primary school, lower vocational secondary education; "middle education" to middle intermediate general secondary education or intermediate vocational education, and "higher education" to higher general secondary education, higher vocational education or university education.

## **Measures**

### ***Gilbert's theory of emotion regulation***

To empirically explore Gilbert's theory of emotion regulation and to measure the perceived importance of threats, soothers and drives a questionnaire was specifically developed for this study. The questionnaire included 40 items each for threats, soothers and drives. Items were derived from two exploratory studies (FERB 19-219 & 19-274) which produced qualitative components fitting the definition of the systems and which are applicable to people with somatic symptoms. Each item was rated on a scale from 1 to 5 where 1 is 'not at all important' and 5 'very important'. Generally, the aim of this data collection was to examine the quality of the items, explore dimensional structures and validate internal consistency. Specifically, the current study examined dimensions in drives and soothers that fit the concept of PF, and to see whether a psychological dimension arises from the threat items. An improved version of the questionnaire that could be derived from this study has the potential to be used to measure individual differences in the clinical field, which could be targets in therapy.

### ***Severity of symptoms***

The Patient Health Questionnaire (PHQ) is a subscale used to rate the severity of somatic symptoms (Kroenke et al., 2002). The 15 symptoms included serve to describe typical physical symptoms within somatic diseases with a representation of 90%. The item scores are scaled from 0 ("not bothered at all") to 2 ("bothered a lot"), and the total score to capture severity ranges from 0 to 30, with cut-off scores at 5-minimal, 10-low, 15-medium and above that 15 to 30 being high. Further, Cronbach's  $\alpha$  is 0.8 for the PHQ-15, so it has a high internal reliability and its validity have been shown to be high also, with a strong association with other scales. When its score increases, it has been shown to correlate significantly with healthcare utilization, disability days and symptom-related difficulty in activities and relationships. It also has its strongest associations with general health perceptions, bodily pain, and physical and role functioning (Kroenke et al., 2002).

### ***Emotional well-being***

The RAND SF-36 questionnaire was used to assess mental well-being and physical functioning (VanderZee, Sanderman, Heyink, & De Haes, 1996). The questionnaire consists of 36 questions, measuring both positive and negative health status including the 8 subscales. A 3-to-6-point Likert scale is used for the item scores, where higher scores indicate better health status and from which, two composite scores of mental and physical health were calculated, according to the analysing method of Hays (van Middendorp et al., 2016). The internal consistency of the measure is high, with Cronbach's alpha ranging from 0.71 to 0.93. Furthermore, convergent validity is high, compared to non-corresponding scales, higher correlation with corresponding scales from other instruments were observed. Specifically, in this study the subscale emotional well-being was used as an outcome measure, to see how a psychological threat dimension and a PF like dimension are related to emotional well-being.

### ***Statistical analysis***

SPSS version 26.0 for windows was used for statistical analyses. A  $p$  value  $< 0.05$  was considered significant for all test statistics conducted. Principal axis factoring with oblimin rotation was used to derive the factor structure and dimensions.

To determine the number of factors, the eigenvalue criterion (1), the scree plot of eigenvalues and the pattern and content of factor loadings were used as a guidance (Field, 2009) together with the other factors. An item was considered to be part of the factor when the factor loading on this dimension was greater than 0.45 (Comrey & Lee, 1992). Also, items would have been excluded if they loaded higher than 0.32 on another factor, but this was not the case in any of the factor analyses (Costello & Osborne, 2005). The internal consistency of the final dimensions was calculated using Cronbach's  $\alpha$  coefficients.

To see if age, gender, educational status and marital status were associated with on the outcome measure emotional well-being, a covariate analysis was conducted.

To test the hypothesis that PF acts as a buffer between mental distress threats and emotional well-being, regression analyses with bootstrapping (1000) were conducted using the Process macro by Hays (Hayes, 2013). Furthermore, the same procedure was used to test whether PF acts as a buffer between symptom severity and emotional well-being.

## Results

### Psychological flexibility and Threat factor

All factors derived and mentioned in this section can be found in table 2 and include the belonging items, factor loadings, Eigenvalues, explained variance and Chronbach's  $\alpha$ .

To see whether a dimension arised that fits the concept of PF, three factor analyses using principal axis factoring were conducted. The first factor analysis included both soothers and drives, and the scree plot of eigenvalues after rotation suggested three factors. The factor analysis yielded a Kaiser-Meyer-Olkin measure (KMO) of sampling adequacy of 0.92, indicating that the factors were distinct and reliable (Field, 2009). Further, the Bartlett's test of sphericity was significant ( $\chi^2=16814.892, p<.0001$ ), meaning that the null hypothesis that the variable in the correlation matrix are uncorrelated should be rejected (Field, 2009). Importantly, content wise the first factor fitted the concept of PF best and explained 25.8% of the variance, and showed a good reliability with Chronbach's  $\alpha$  of 0.941 (Bland & Altman, 1997). It was therefore named "Psychological flexibility (PF)" and is shown as first section of table 2.

The second factor analysis was conducted with just drives, suggesting three factors which after a subsequent factor analysis showed to be appropriate (KMO=0.929; Bartlett's test:  $\chi^2=6997.348, p<.0001$ ). The first factor also fitted the concept of PF, including the same drive items as the first analysis with both soothers and drives (although the previous analysis had some additional drive items) and explained 31.3% of the variance. Chronbach's  $\alpha$  was 0.92 and therefore good. This factor was labelled "Drive Psychological Flexibility (Drive PF)" and can be found under the second section of table 2.

The third factor analysis was conducted with only soother items also implied three factors, again with a subsequent and appropriate factor analysis (KMO=0.906; Bartlett's test:  $\chi^2=5753.470$ ,  $p<.001$ ). The first factor showed items that are characteristic of PF, and included additional soother items that were not included in the factor analysis of soothers and drive items together. The explained variance of this factor was 26.18% and showed good reliability with Chronbach's  $\alpha$  of 0.84. Therefore, the factor was labelled "Soother Psychological Flexibility (Soother PF)" shown in the third section of table 2.

A fourth factor analysis with threats was conducted, to see if a mental distress threat factor existed. The analysis suggested three factors (KMO=0.932; Bartlett's test:  $\chi^2=780$ ,  $p<0,001$ ). Indeed, the first factor included items that describe distress that arises mentally and was therefore labelled as "mental distress". It explained 32.234% of the variance and a good reliability with Chronbach's  $\alpha$  of 0.94, and can be found in the last section of table 2.

**Table 2.** Factor loadings of the items included in the four derived factors Psychological Flexibility, Drive Psychological Flexibility, Soother Psychological Flexibility and Mental Distress. Eigenvalues, percentages of explained variance, and internal consistency coefficients (Cronbach's  $\alpha$ ) of the final items in the Fibromyalgia sample ( $n=402$ ).

Psychological Flexibility Items ( $n=25$ )	Factor loadings
D 36. To have a good quality in life	.749
D 9. To accept myself (e.g. to be kind and not judgemental with myself)	.714
D 16. To accept my body, disease or symptoms	.714
D 32. To have time for myself including relaxation and being alone	.672
D 34. Live in harmony with my disease	.669
D 25. To develop myself as a person and pursue what I value	.645
D 5. To respect my own boundaries and setting them clearly to others	.639
D 31. To deal with adverse circumstances in an adaptive, healthy and positive way	.637
S 34. My limits or boundaries	.622
D 40. To strengthen my self-esteem	.615
D 38. To be calm and at peace	.607
D 21. To be happy and joyful	.599
D 6. To think positive	.593
D 35. To have a fixed routine in life	.578

D 18. To pursue my passions and interests	.577
D 39. Following a healthy diet and exercise	.574
S 16. Good balance between activities and relaxation	.573
D 7. To be independent (financially, physically, etc.)	.557
D 11. To enjoy positive things or activities in life	.530
D 14. To sleep well	.529
S 8. Having the freedom to do something in the way I want to do it myself	.493
D 8. To be able to function normally in life	.490
D 15. To move forward despite obstacles	.476
D 19. To enjoy myself with leisure time activities (e.g. reading a book, drawing, singing or watching sports or a movie)	.462
S 22. To take a rest or a break	.452
<b>Eigenvalue</b>	20.6
<b>% of variance</b>	25.8
<b>Chronbach's <math>\alpha</math></b>	.941

---

### Drive Psychological Flexibility

Items ( $n=17$ )

---

D 9. To accept myself (e.g. to be kind and not judgmental with myself)	.727
D 16. To accept my body, disease or symptoms	.710
D 34. Live in harmony with my disease	.666
D 36. To have a good quality of life	.661
D 32. To have time for myself, including relaxation and being alone	.637
D 5. To respect my own boundaries and setting them clearly to others	.636
D 40. To strengthen my self-esteem	.624
D 25. To develop myself as a person and pursue what I value	.599
D 31. To deal with adverse circumstances in an adaptive, healthy and positive way	.584
D 38. To be calm and at peace	.575
D 6. To think positive	.564
D 39. Following a healthy diet and exercise	.547
D 21. To be happy and joyful	.517
D 18. To pursue my passions and interests	.513
D 7. To be independent (financially, physically, etc.)	.510
D 35. To have a fixed routine in life	.498
D 19. To enjoy myself with leisure time activities (e.g. reading a book, drawing, singing or watching sports or a movie)	.452

<b>Eigenvalue</b>	12.54
<b>% of variance</b>	31.36
<b>Chronbach's <math>\alpha</math></b>	.924

---

**Soother Psychological Flexibility**

 Items ( $n=10$ )
 

---

S 15. Calm surrounding	.748
S 33. Secure and trusted environment	.659
S 16. Good balance between activities and relaxation	.645
S 34. My limits and boundaries	.617
S 22. To take a rest or a break	.614
S 8. Having the freedom to do something in the way I want to do it myself	.590
S 18. Healthy or good nutrition	.583
S 9. Consistency and structure	.520
S 1. Mindfulness	.484
S 30. Comfortable posture	.456

<b>Eigenvalue</b>	10.47
<b>% of variance</b>	26.18
<b>Chronbach's <math>\alpha</math></b>	.843

---

**Mental Distress**

 Items ( $n=16$ )
 

---

T 24. Being angry	.823
T 32. A negative thought	.816
T 23. A negative life event	.793
T 16. Feeling sad or helpless	.770
T 27. An argument	.753
T 12. Having worries	.740
T 14. Memory of negative past event	.716
T 17. Social pressure	.676
T 18. Getting negative judgements or comments	.670
T 33. An expectation that I cannot live up to	.643
T 7. A situation that triggers irritation or anger	.641
T 29. Feeling lonely	.630
T 2. Being stressed or tense	.593

T 19. Lack of understanding from others	.551
T 5. Time pressure	.527
T 40. Being perfectionistic	.518
<b>Eigenvalue</b>	12.894
<b>% of variance</b>	32.234
<b>Chronbach's <math>\alpha</math></b>	.938

---

### Psychological flexibility as a buffer

To see whether PF acts as a buffer between symptom severity and emotional well-being, three regression analyses were conducted and are shown in table 3. Beforehand, a covariate analysis was conducted that showed that age, gender and education level were not associated with emotional well-being. Relationship status, however, was significant as a covariate (Pearson's correlation=0.125,  $p=0.012$ ), and was included in analyses. The independent variable was symptom severity which was derived from the total PHQ-15 score. It was measured on the outcome of emotional well-being as dependent variable. The previously established PF factors were used as moderators. The first analysis with general PF as a moderator was significant ( $F=22.119$ ,  $R^2=0.182$ ) and showed a significant interaction effect ( $p=0.04$ ), depicted in Figure 1. The covariate relationship status was significant in this model ( $p=0.032$ ), which means that relationship status is related to emotional well-being after controlling for the other variables in the model, so it might have influenced other variables. The interaction showed that PF acts as a buffer between symptom severity and emotional well-being, however not strongly. Still, especially in the case when symptom severity is high, high level PF will act as a buffer more strongly.

The second regression model with drive PF was significant ( $F=22.38$ ,  $R^2=0.184$ ), with main effects for symptom severity ( $p<0.0001$ ) and PF ( $p=0.013$ ). The interaction effect was not significant ( $p=0.059$ ). That means that symptom severity and Drive PF are both related to emotional well-being, but Drive PF did not act as a buffer. Again, the covariate was significant ( $p=0.027$ ), so associated with emotional well-being in this model. The third

analysis with Soother PF was significant ( $F=23.997$ ,  $R^2=0.195$ ) and had a significant main effect for symptom severity ( $p<0.0001$ ) but not for soother PF ( $p=0.185$ ), which means that soother PF here, was not related to emotional well-being. However, the interaction effect was significant ( $p<0.0001$ ) which shows that having a high soother PF level is a buffer when symptom severity is high, so it protects against the impact of symptom severity on emotional well-being, Figure 2 depicts the interaction. Also here, the covariate was significant ( $p=0.039$ ).

To test whether PF also acts as a buffer between the threat factor 'mental distress' and emotional well-being, three regression analyses were conducted which results that are depicted in table 4. In all regression analyses, the covariate relationship status as covariate was not significant. The independent variable was 'mental distress' and emotional well-being was the dependent variable, which score was derived from the SF-36 subscale. The same PF factors were used as moderators. The first regression model included the general PF factor as a moderator ( $F=76.028$  and adjusted  $R^2=0.43$ ), the interaction was sufficiently significant ( $p=0.039$ ) and is depicted in Figure 3. Then, the second regression model included the Soother PF factor ( $F=75.602$  and adjusted  $R^2=0.432$ ) and the interaction was highly significant ( $p<0.0001$ ), as depicted in Figure 4. The third regression analysis included the Drive PF factor ( $F=75.36$ ,  $R^2=0.432$ ) but the interaction was not significant ( $p=0.073$ ). Therefore, consistent with the hypothesis PF does indeed act as a buffer, however, only when both soother and drives or only soothers are included, since the interaction effect for only drives was not significant. That means higher levels of mental distress and lower levels of PF/sootherPF were associated with lower emotional well-being or, the other way around, lower levels of mental distress and higher levels of PF/sootherPF is associated with better emotional well-being. Moreover, the interaction effect shows that especially in the case when threat severity is high, high level PF/sootherPF will act as a buffer most strongly. The interception reflects that the relation between high perceived mental distress and low emotional well-being is stronger for people with low PF/sootherPF.

**Table 3.** Results of regression analysis of Symptom severity associated with Emotional Well-being examining three Psychological flexibility variables as moderators and Relationship status as covariate.

Variables	Statistical values					
	$R^2$	$B$	(S.E.)	$t$	$p$ -value	95% CI
<b>Psychological flexibility</b>						
constant	0.182	35.842	1.064	33.702	<0.0001	[33.752, 37.933]
Symptom severity		-1.067	0.14	-7.642	<0.0001	[-1.341, -0.792]
PF		2.214	1.065	2.080	0.038	[0.121, 4.307]
Symptom severity x PF		0.482	0.234	2.059	0.04	[0.022, 0.943]
Relationship status		2.59	1.202	2.155	0.032	[0.227, 4.952]
<b>Drive Psychological flexibility</b>						
constant	0.184	35.777	1.061	33.714	<0.0001	[33.69, 37.863]
Symptom severity		-1.062	0.139	-7.618	<0.0001	[-1.337, -0.788]
Drive PF		2.453	0.983	2.496	0.013	[0.521, 4.385]
Symptom severity x Drive PF		0.414	0.219	1.891	0.059	[-0.016, 0.845]
Relationship status		2.657	1.199	2.216	0.027	[0.299, 5.015]
<b>Soother Psychological flexibility</b>						
constant	0.195	35.941	1.056	34.032	<0.0001	[33.864, 38.017]
Symptom severity		-1.120	0.137	-8.150	<0.0001	[-1.39, -0.849]
Soother PF		1.263	0.951	1.329	0.185	[-0.606, 3.132]
Symptom severity x Soother PF		0.865	0.222	3.903	<0.0001	[0.429, 1.3]
Relationship status		2.469	1.190	2.074	0.039	[0.129, 4.808]

Fig. 1 Emotional well-being predicted by symptom severity and psychological flexibility (PF) including soothers and drives.

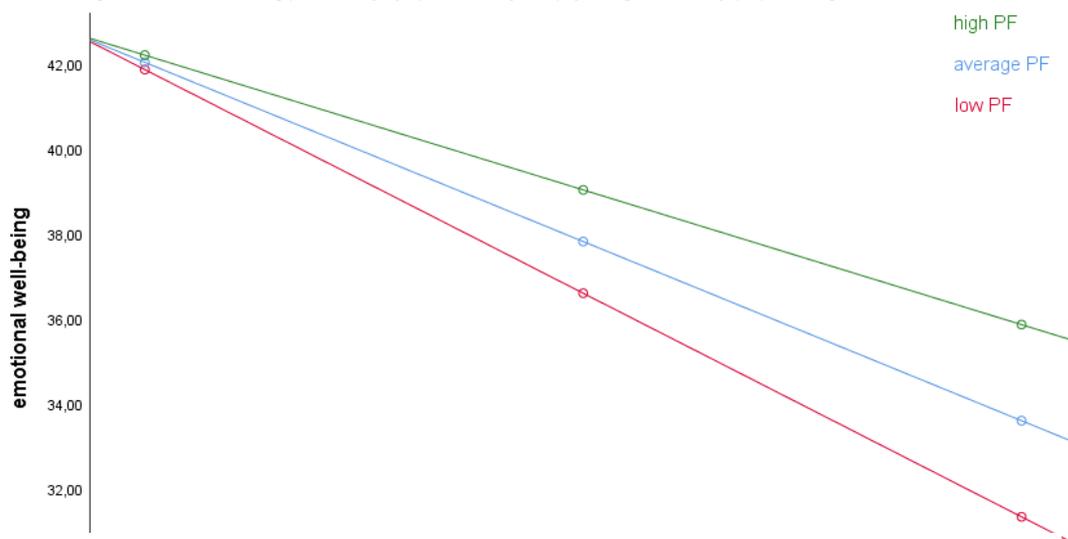
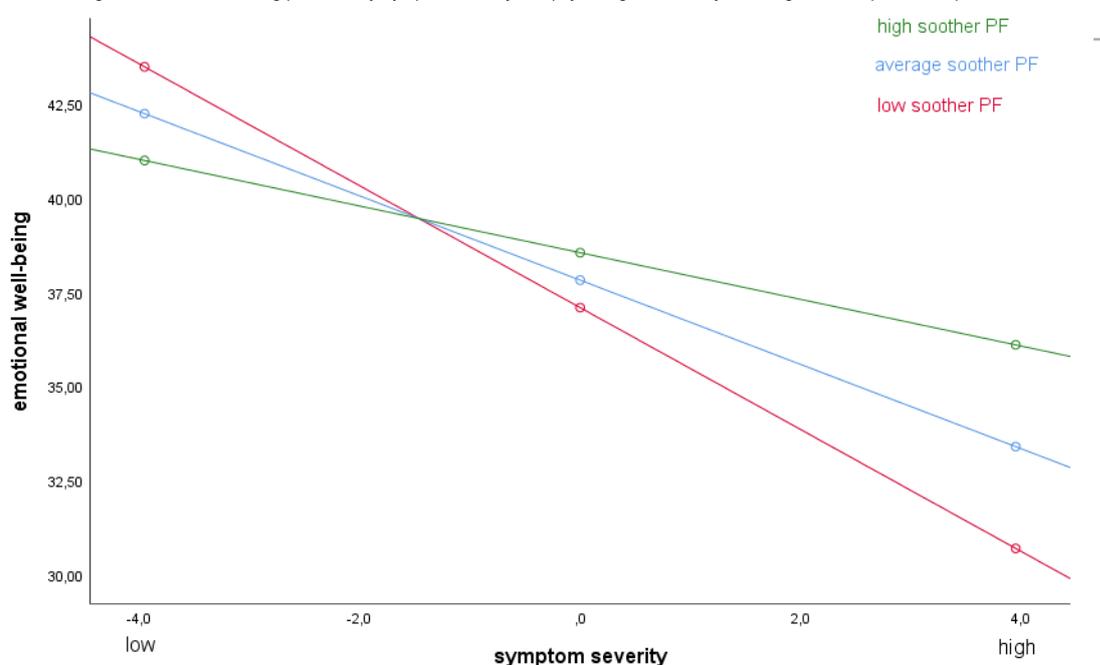


Fig. 2 Emotional well-being predicted by symptom severity and psychological flexibility including soothers (soother PF).



**Table 4.** Results of regression analysis of Mental Distress associated with Emotional Well-being examining three Psychological flexibility variables as moderators and relationship status as covariate.

Variables	Statistical Values					
	$R^2$	$B$	(S.E.)	$t$	$p$ -value	95% CI
<b>Psychological flexibility</b>						
constant	0.434	36.296	0.888	40.895	<0.0001	[34.551, 38.041]
Mental distress		-10.207	0.622	-16.407	<0.0001	[-11.431, -8.984]
PF		6.027	0.842	7.162	<0.0001	[4.373, 7.682]
mental distress x PF		2.324	1.125	2.066	0.039	[0.113, 4.536]

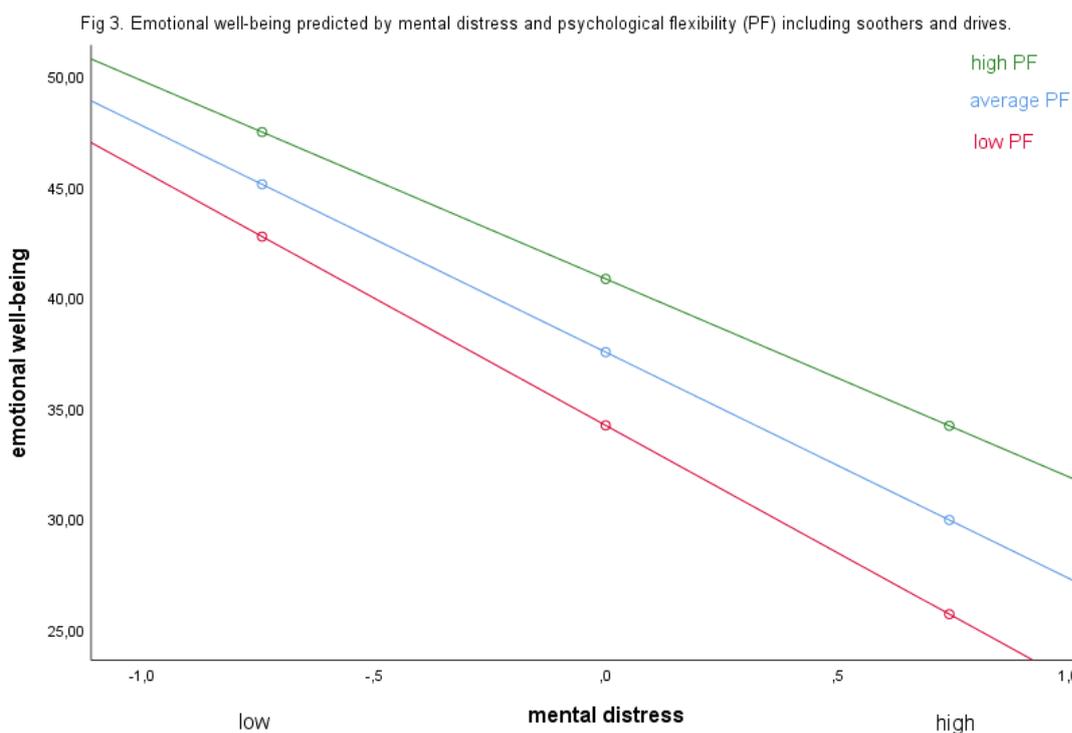
Relationship status		1.607	1.001	1.606	0.109	[-0.361, 3.575]
---------------------	--	-------	-------	-------	-------	-----------------

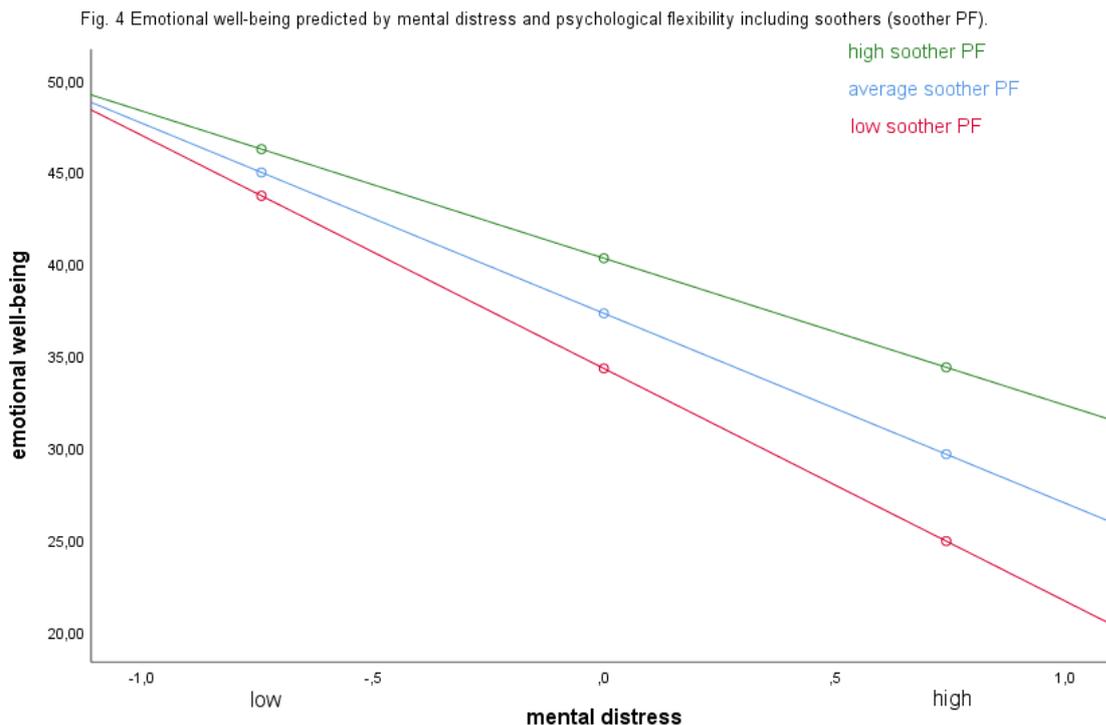
### Drive Psychological flexibility

constant	0.432	36.206	0.887	40.801	<0.0001	[34.462, 37.951]
Mental distress		-10.115	0.623	-16.243	<0.0001	[-11.339, -8.89]
Drive PF		5.695	0.785	7.251	<0.0001	[4.151, 7.239]
Mental distress x Drive PF		1.883	1.046	1.800	0.073	[-0.173, 3.939]
Relationship status		1.770	1.001	1.767	0.078	[-0.199, 3.738]

### Soother Psychological flexibility

constant	0.432	36.032	0.887	40.614	<0.0001	[34.288, 37.776]
Mental distress		-10.326	0.627	-16.476	<0.0001	[-11.558, -9.094]
Soother						
PF		5.191	0.804	6.456	<0.0001	[3.61, 6.771]
Mental distress x Soother PF		4.033	1.031	3.911	<0.0001	[2.006, 6.061]
Relationship status		1.669	1.002	1.666	0.096	[-0.3, 3.638]





## Discussion

The purpose of this study was to explore psychological flexibility, guided by Gilbert's theory of emotion regulation as a framework using a questionnaire that quantified threats, soothers and drives in the FM population. Specifically, it was hypothesized that dimensions arose that have PF-like characteristics, which was indeed revealed by factor analyses. Further, it was hypothesized that these PF dimensions would act as a buffer between symptom severity and emotional well-being. Regression analyses showed that a PF dimension that included both soothers and drives (general PF) indeed was indicated to act as a buffer, most strongly when symptom severity was high. PF with soothers only indicated to act as a buffer when symptom severity was high. Furthermore, it was hypothesized that a threat dimension with mental distress items would arise and that when its severity was high and PF was high, PF would act as a buffer between the perceived threat severity of mental distress and emotional well-being. PF with soothers and drives and PF with soothers were

indicated to act as buffers and most strongly when mental distress threat severity was high, also shown by regression analyses.

Factor analyses with soothers and drives together and with soothers and drives separately, showed that three dimensions arose that included items that are in line with how PF is conceptualized. The approach used in this study was inductive rather than deductive. A theoretical concept was derived from empirical items, therefore, it is likely that PF is not represented exactly how it is conceptualized, but only certain components. It must also be noted that soother PF included additional items that were not part of general PF, while drive PF just included items that were part of the general PF. However, the items in these factors describe acceptance, values and committed action and to deal with difficulties adaptively. Hayes (2006) who conceptualized components of PF in the Hexaflex model describes processes that relate to mindfulness, acceptance, commitment and behaviour change, therefore in line with the results found here, justifying that the factors that were derived from soothers and drives mentioned by people with persistent somatic symptoms to a certain degree represent PF.

A strength of PF as a concept is that its approach aims at creating principles that guide adaptive action. It is a dynamic concept and is able to describe fluctuating and contextually-specific behaviours used for dealing with everyday life challenges (McCracken & Morley, 2014). However, PF mostly has been studied in the context of ACT where in the majority of this research rather psychological inflexibility is explored. Most of these studies rely on the Acceptance and Action Questionnaire (AAQ-I and II), which has shown validity problems and high correlations with measures of psychological distress, rather measuring negative emotionality than an adaptive response to it (Doorley et al., 2020). Furthermore, in this and in other measurements of PF, it is rather measured as an outcome than a component of daily life, they describe valued goal pursuit in an abstract and future-oriented way, decreasing the likelihood that the concept is actually measured. Also, none of the scales incorporate aspects of instrumental emotion regulation. The Personalized Psychological Flexibility Index (PPFI)

was developed to address the limitations of other measurements. They found it to be a stronger predictor of outcomes central to the theory of PF, including effective daily goal pursuit, effective pursuit of broader personal strivings and emotion regulation strategy use in response to daily stressors. The scale predicted distress tolerance, subjective happiness, life satisfaction, purpose and meaning in life and psychological needs satisfaction (Doorley et al., 2020). It needs to be further examined whether the dimensions derived in the current study that include items that describe self-regulatory strategies fitting with the concept of PF as part of daily life, is a more appropriate measure and might extend the literature with concrete examples of how PF can be measured.

The study supported the hypothesis that PF might act as a buffer between symptom severity and emotional well-being. The findings are unique because they were able to refine to what extent PF might act as a buffer by differentiating soothers and drives or putting them together. General PF was indicated to indeed act as a buffer, most strongly when symptom severity was high, however experimental research is needed to provide evidence. Drive PF was negatively associated with symptom severity, however was not indicated to act as a buffer. Interestingly, soother PF was not generally related to emotional well-being but was indicated to act as a buffer when symptom severity was high. A possible explanation could be that when severity is low, other factors are relevant for emotional well-being than the PF soothers included in the dimension.

The findings suggest when symptom severity is high, PF and soother PF are associated positively with emotional well-being. It could be that when severity has a larger impact on life and emotional well-being is lower as seen in this study, coping and responding to the circumstances effectively is especially important, as theorized by Hayes et al. (2006). The result that general PF was indicated to act as a buffer is in accordance with previous findings, a previous study found that PF buffers from the negative impact of somatization on physical and environmental quality of life (Leonidou et al., 2019). When looking at treatment effects of ACT for chronic pain on life satisfaction and disability, PF mediated the outcomes.

Importantly, pain, emotional distress, fear of movement, and self-efficacy did not (McCracken & Vowles, 2014). That indicates that it might not just be the pain itself or emotional distress that affects well-being but the way it is perceived and coped with. Therefore, valuing components of PF might enable to remain engaged with life, to achieve goals, while accepting the symptoms and current circumstances (Kashdan & Rottenberg, 2010).

The study refined current literature on how the perceived importance of PF regulation strategies, so to soothe and attain value related goals, can impact emotional well-being positively. Future research should replicate these findings and further explore how a distinction between soothers and drives might affect the buffering impact of PF on well-being. It should be emphasised that PF does not just relate to upregulating positive emotions, but also to using negative emotions to adapt behaviour functionally (Kashdan & Rottenberg, 2010). Therefore, causality needs to be explored and contextual findings need to be considered, such as that negative affect in FM has been associated with severity of pain and symptom levels but also with cognitive impairment, and that a deficit in experiencing positive affect was found in FM, whereas fewer symptoms occur in FM individuals with more positive affect (Galvez-Sánchez et al., 2018; van Middendorp et al., 2008). Therefore, findings regarding the relationship between flexible coping and emotional well-being might apply only to a subset of individuals with certain affective characteristics. Additionally, since soother PF was not generally related to emotional well-being research should explore which factors might affect impact of symptoms on well-being when severity is low.

Next, the third hypothesis was confirmed, general PF and soother PF were indicated to act as a buffer between threats related to mental distress and emotional well-being, most strongly when mental distress was high. When mental distress was low, both also were indicated to act as a buffer but general PF did somewhat more than soother PF. Drive PF was related to emotional well-being but it was not implied to be a buffer. First of all, the findings extend the literature by providing concrete examples of mental distress threats in the FM population, which is relevant because distress likely plays a key role in the sensitization

of the nervous system observed in FM (Adams & Turk, 2015). Importantly, these results suggest that when perceiving mental distress as a high threat, PF regulation strategies are associated positively and more strongly with emotional well-being. A reason that PF regulation strategies were valued higher could be because they might have been efficient in improving emotional well-being before. When accepting the current circumstances and continuing to strive for goals and remain functional in daily life, one might see them self as more capable and efficient in coping with distress and negative emotions when faced with a threat (Kashdan & Rottenberg, 2010). Moreover, following the analogy that people who use emotional avoidance strategies often have difficulties separating emotions from bodily sensations, those who accept and approach negative emotions might find it easier to distinguish them from FM symptoms and appraise emotions differently, having less avoidance of negative emotions and less fear of potentially distress inducing activities. Therefore, they might be less hypervigilant towards pain, as suggested in the fear-avoidance model, which could be associated with more positive emotional states and well-being (Adams & Turk, 2015; Malin & Littlejohn, 2016; McCracken & Morley, 2014). Supporting this, a study showed that only FM individuals that lacked ability to process or describe emotions, intense experience of emotions was related to more pain (van Middendorp et al., 2008). These findings offer support for acceptance of mental distress and value committed action being important targets for psychological interventions in FM. Reducing distress itself might be also functional, when that promotes acceptance and valued committed functioning and if it stimulates emotional processing and expression (Doorley et al., 2020; van Middendorp et al., 2008). Therefore, future research should further explore distress perception as well as distress coping in the context of PF to make psychological interventions more efficient.

In sum, the current study highlights the importance of PF components for individuals with FM and provides correlational evidence for PF's role in buffering negative impact of symptom severity and perception of mental distress on emotional well-being, especially when severity is high. That suggests that perception of symptoms, and ability to cope with mental distress might be as relevant targets for interventions as actual pain and mental distress levels. The

study integrated PF into Gilbert's theory, which is a promising framework to explain FM symptomatology. Moreover, by differentiating between PF soothers and PF drives, results refined under which circumstances importance of PF is implied to be a buffer. Measuring PF in the context of emotion regulation systems should be explored further by research. Importantly, these results support the effectiveness of interventions that target PF ability and suggest that this is especially the case for individuals with more severe FM.

Strengths of the study were that the sample was large ( $n=402$ ) and that the PROCESS macro was used to assess moderation, which might provide more stable results than traditional regression approaches (Hayes, 2013), because they are less prone to error. A limitation is the cross-sectional nature of the study, causal inferences cannot be made and so experimental studies are needed to establish causation. Also the study is limited by that the questionnaire relied on self-report to measure PF as a construct, therefore the importance of PF was measured but the actual PF ability cannot be inferred with certainty.

The finding that distinguishing between the perceived importance of PF soothers and PF drives indicated a different buffering effect of PF on emotional well-being suggests that future research needs to explore further how different emotion regulation strategies as components of PF are associated with well-being. To do so, future studies need to explore drives and soothers that represent PF most accurately. Moreover, it should also be examined to what extent the perceived importance of these strategies represents actual PF ability. With that, it can be examined which PF components are connected to certain skills or motivations to regulate, such as soothing or driving and that are more relevant for the FM population in improving well-being. Also interventions that change emotional processing and expression should be tested (van Middendorp et al., 2008).

## References

- Adams, L., & Turk, D. (2015). Psychosocial factors and central sensitivity syndromes. *Current Rheumatology Reviews*, 11(2), 96–108.  
<https://doi.org/10.2174/1573397111666150619095330>
- Albrecht, P. J., & Rice, F. L. (2016). Fibromyalgia syndrome pathology and environmental influences on afflictions with medically unexplained symptoms. *Reviews on Environmental Health*, 31(2). <https://doi.org/10.1515/reveh-2015-0040>
- Bland, J. M., & Altman, D. G. (1997). Statistics notes: Cronbach's alpha. *British Medical Journal*, 314(7080), 572.
- Comrey, A. L., & Lee, H. B. (1992). *A first course in factor analysis*. Lawrence Erlbaum Associates.
- Costello, A. B., & Osborne, J. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research, and Evaluation*, 10(1), 7.

- Doorley, J. D., Goodman, F. R., Kelso, K. C., & Kashdan, T. B. (2020). Psychological flexibility: What we know, what we do not know, and what we think we know. *Social and Personality Psychology Compass*, *14*(12), 1–11. <https://doi.org/10.1111/spc3.12566>
- Field, M., & Golubitsky, M. (2009). *Symmetry in chaos: A search for pattern in mathematics, art, and nature*. Society for Industrial and Applied Mathematics.
- Galvez-Sánchez, C. M., Duschek, S., & Reyes del Paso, G. A. (2019). Psychological impact of fibromyalgia: Current perspectives. *Psychology Research and Behavior Management*, *12*, 117–127. <https://doi.org/10.2147/PRBM.S178240>
- Galvez-Sánchez, C. M., Reyes del Paso, G. A., & Duschek, S. (2018). Cognitive impairments in fibromyalgia syndrome: Associations with positive and negative affect, alexithymia, pain catastrophizing and self-esteem. *Frontiers in Psychology*, *9*, 377. <https://doi.org/10.3389/fpsyg.2018.00377>
- Gilbert, P. (2014). The origins and nature of compassion focused therapy. *British Journal of Clinical Psychology*, *53*(1), 6–41. <https://doi.org/10.1111/bjc.12043>
- Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. The Guilford Press.
- Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes and outcomes. *Behaviour Research and Therapy*, *44*(1), 1–25. <https://doi.org/10.1016/j.brat.2005.06.006>
- Kashdan, T. B., & Rottenberg, J. (2010). Psychological flexibility as a fundamental aspect of health. *Clinical Psychology Review*, *30*(7), 865–878. <https://doi.org/10.1016/j.cpr.2010.03.001>
- Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2002). The PHQ-15: Validity of a new measure for evaluating the severity of somatic symptoms: *Psychosomatic Medicine*, *64*(2), 258–266. <https://doi.org/10.1097/00006842-200203000-00008>
- Leonidou, C., Panayiotou, G., Bati, A., & Karekla, M. (2019). Coping with psychosomatic symptoms: The buffering role of psychological flexibility and impact on quality of life.

- Journal of Health Psychology*, 24(2), 175–187.  
<https://doi.org/10.1177/1359105316666657>
- Littlejohn, G., & Guymer, E. (2018). Central processes underlying fibromyalgia. *European Medical Journal*, 3, 79-86.
- Malin, K., & Littlejohn, G. O. (2016). Psychological factors mediate key symptoms of fibromyalgia through their influence on stress. *Clinical Rheumatology*, 35(9), 2353–2357.  
<https://doi.org/10.1007/s10067-016-3315-9>
- Marshall, E.-J., & Brockman, R. N. (2016). The relationships between psychological flexibility, self-compassion, and emotional well-being. *Journal of Cognitive Psychotherapy*, 30(1), 60–72. <https://doi.org/10.1891/0889-8391.30.1.60>
- McCracken, L. M. (2013). Committed action: An application of the psychological flexibility model to activity patterns in chronic pain. *The Journal of Pain*, 14(8), 828–835.  
<https://doi.org/10.1016/j.jpain.2013.02.009>
- McCracken, L. M., & Morley, S. (2014). The psychological flexibility model: A basis for integration and progress in psychological approaches to chronic pain management. *The Journal of Pain*, 15(3), 221–234. <https://doi.org/10.1016/j.jpain.2013.10.014>
- McCracken, L. M., & Velleman, S. C. (2010). Psychological flexibility in adults with chronic pain: A study of acceptance, mindfulness, and values-based action in primary care. *Pain*, 148(1), 141–147. <https://doi.org/10.1016/j.pain.2009.10.034>
- McCracken, L. M., & Vowles, K. E. (2014). Acceptance and commitment therapy and mindfulness for chronic pain: Model, process, and progress. *American Psychologist*, 69(2), 178–187. <https://doi.org/10.1037/a0035623>
- Papi, R. (2020). *The content and significance of the soothing system in fibromyalgia: A concept mapping study*. 30.
- Pinto, A. M., Geenen, R., Palavra, F., Lumley, M. A., Ablin, J. N., Amris, K., Branco, J., Buskila, D., Castelo-Branco, M., Crofford, L. J., Fitzcharles, M.-A., Luís, M., Reis Marques, T., Rhudy, J. L., Uddin, L. Q., Castilho, P., Jacobs, J. W. G., & da Silva, J. A. P. (2020). *An updated overview of the neurophysiological and psychosocial dimensions of*

*fibromyalgia - a call for an integrative model*

[<https://doi.org/10.20944/preprints202007.0224.v1>]

- Pulido-Martos, M., Luque-Reca, O., Segura-Jiménez, V., Álvarez-Gallardo, I. C., Soriano-Maldonado, A., Acosta-Manzano, P., Gavilán-Carrera, B., McVeigh, J. G., Geenen, R., Delgado-Fernández, M., & Estévez-López, F. (2020). Physical and psychological paths toward less severe fibromyalgia: A structural equation model. *Annals of Physical and Rehabilitation Medicine*, 63(1), 46–52. <https://doi.org/10.1016/j.rehab.2019.06.017>
- Vander Zee, K. I., Sanderman, R., Heyink, J. W., & de Haes, H. (1996). Psychometric qualities of the RAND 36-Item Health Survey 1.0: a multidimensional measure of general health status. *International Journal of Behavioral Medicine*, 3(2), 104-122.
- van Middendorp, H., Kool, M. B., van Beugen, S., Denollet, J., Lumley, M. A., & Geenen, R. (2016). Prevalence and relevance of type D personality in fibromyalgia. *General Hospital Psychiatry*, 39, 66–72. <https://doi.org/10.1016/j.genhosppsy.2015.11.006>
- van Middendorp, H., Lumley, M. A., Jacobs, J. W. G., van Doornen, L. J. P., Bijlsma, J. W. J., & Geenen, R. (2008). Emotions and emotional approach and avoidance strategies in fibromyalgia. *Journal of Psychosomatic Research*, 64(2), 159–167. <https://doi.org/10.1016/j.jpsychores.2007.08.009>
- Vowles, K. E., Sowden, G., & Ashworth, J. (2014). A comprehensive examination of the model underlying acceptance and commitment therapy for chronic pain. *Behavior Therapy*, 45(3), 390–401. <https://doi.org/10.1016/j.beth.2013.12.009>
- Winfield, J. B. (2001). Does pain in fibromyalgia reflect somatization?.