Universiteit Utrecht

The soother dimensions of chronic fatigue syndrome and their interactions with mental well-being and symptoms severity.

Diederik Aalbers

Faculteit Sociale Wetenschappen

Universiteit Utrecht

Clinical Psychology

Date: 19-02-2021

Student number 5667364

Academic supervisor: Rinie Geenen

Word count (body of text): 4624

Abstract

Focusing on soothing dimensions in people with chronic fatigue syndrome (CFS) may broaden the potential treatments for these individuals with as a final result improvement of treatment. The current study aims to investigate whether and which soother dimensions can be distinguished in patients with chronic fatigue syndrome, whether and to what extent these dimensions are correlated with mental well-being and symptom severity, and whether soothers are able to moderate (buffer) the association between symptom severity and mental well-being. An online questionnaire was used to investigate the mental well-being (RAND SF-36), symptom severity (PHQ-15) and individual scores on 40 soother items of 441 participants, with CFS and fibromyalgia (due to overlap of symptoms and problems). Using a factor analysis to determine said dimensions of soothing. In this study, three dimensions were found, namely Autonomy & balance, Social connectedness & positive mindset, and Alternative soothers. A significant interaction between symptom severity and Autonomy & balance predicting mental well-being was found. The association between symptom severity and low mental well-being was stronger for people with low than high scores on Autonomy & balance. Next to that, higher scores on Social connectedness & positive mindset correlated with better mental well-being. Furthermore, a higher score on Alternative soothers correlated with higher symptoms severity. This study indicates the potential usefulness of two classes of soothers, Autonomy & balance, and Social connectedness & positive mindset, as an antidote against the impact of symptom severity on mental well-being.

1. Introduction

Chronic fatigue syndrome (CFS) can be identified by several primary symptoms: the inability to do things that were normal before the illness for at least six months, after physical or mental activity a short period of worsened symptoms and sleep problems. Additionally, to the core symptoms are problems with thinking and memory, and a short period of worsened symptoms after standing or sitting upright (Center for Disease Control, n.d.) combined with various common symptoms like muscle pain or other specific symptoms (e.g., shortness of breath, chills, and night sweats, etc.) (Van Middendorp et al., 2001). There seems to be an indication that psychological and physiological factors are involved in the cause of CFS; however, the exact cause is not yet identified. CFS has been linked with disorders involved with the central nervous system and with the immune system, and abnormalities on the cardiovascular level (Estévez-López et al., 2018). Gilbert's model of affect regulation selects three affect regulations systems, namely the threat-, drive- and soothing systems that may modulate neural activity of somatic symptoms (Gilbert, 2016). Pinto, Geenen, Palavra et al. (2020) explain an interaction between the threat- and soothing systems that could be involved as a source for fibromyalgia, another somatoform disorder. In this situation the threat system is overly active, while the soothing system is working insufficient. Since CFS and fibromyalgia share some overlap, Gilbert's model (2016) could be used to better understand CFS and therefore guide treatment.

In Gilbert's model (2016), the threat system or 'threat and self-protection system' is focused on getting ready and reacting to a threat. The threat system prepares us for defensive actions, ignited by negative emotions. Secondly, there is the drive system or 'drive, seeking and acquisition focused system'. Which promotes behaviour that enables us to pursue our goals in life. This system seems to be connected to sympathetic arousal. Contrary to the threat system, the drive system activates positive emotions like excitement and happiness (Gilbert, 2016). Lastly, there is the soothing system or 'contentment, soothing focused system'. Parallel to the drive system, the soothing system produces positive emotions. Specifically, the soothing system produces a feeling of satisfaction. When activated, the soothing system is linked to affiliative and prosocial behaviours. Furthermore, it shifts the affect state to calmness, safeness, and well-being. The exact link between the soothing system, well-being and CFS is unknown. To elaborate on the soothing system, a safe and calm affect is found to be negatively related to self-criticism, stress, anxiety, and depression (Gilbert et al., 2008). Accordingly, it also has a positive relation with factors associated with well-being (Gilbert & Proctor, 2006). Building on that, a positive affect is linked to less fatigue, when looking at women suffering from pain

disorders (Zautra et al., 2007). Next to that, symptoms severity is known to be linked to physical and mental well-being (Westbrook et al., 2002), more and severe symptoms seem to be related to lower mental well-being (Meyer, 2001). When you combine these findings with the unknown link of the soothing system and well-being in CFS, it is clinically useful to investigate symptom severity combined with these three factors. Findings can have clinical implications, because experiencing activation of the soothing system may show therapeutic effects for these patients (Gilbert & Procter, 2006). A systematic review by Whiting et al. (2001) looked at 44 studies to find the best treatment for CFS patients. From all treatments, cognitive behavioural therapy (CBT) and graded exercise therapy (GET) were found to be most effective. Similar results are found for adolescents (Stulemeijer et al., 2004). These positive findings for CBT on CFS are substantiated by more studies (Wiborg et al., 2010; Price et al., 2008). While the results are positive, no treatment is flawless, and improvements could be made. In this age, the focus of clinical psychology is moving beyond suffering (Ingram & Snyder, 2006). Third-generation therapies, like compassion-therapy, are more focused on the client's strengths, skills or positive attributes. These therapies, based on acceptance, are important when other therapies lack progression with the client. Next to that, research substantiating the positive results of compassion focused therapy is growing (Gilbert, 2008). Finding meaningful soothers for CFS patients could improve the aim and focus of the treatment. This is compliant to patient-centered care; Suggesting that the more personalized the treatment is, the higher motivation, loyalty and satisfaction are, which lowers attrition rates (Olsson et al., 2012). Earlier work suggests that soothers can be seen as resilience factors, like acceptance, self-efficacy, coping skills and social support (Clauw, et al., 2019). In a recent study with patients with somatic symptoms, soothers were determined and grouped using a concept mapping study (Geenen, et al., 2020). Based on the contents of the items, the 40 soothers were sorted into nine clusters by people with persistent somatic symptoms (Geenen, et al., 2020) (see Table 1). An essential next step is to investigate whether and which soother dimensions differentiate between patients with CFS. Investigating the soothing dimensions in CFS patients may result in a concrete focus for the clinical psychology in improving the aim of CBT treatment or it could help broaden the view of treatment for these individuals. The findings could potentially give direction to use specific soothing situations for patients with chronic fatigue syndrome. The clusters presented in Table 1 are used as a guideline for the expected dimensions in this study.

Firstly, several studies suggest that people with higher levels of social support, which can be seen as the supportive part of social connectedness, experience less distress and adjust better overall (Adams & Turk, 2015). In CFS patients specifically, higher levels of social

support indicate higher quality of life (Schoofs et al., 2004). Das et al. (2020) investigated people with a somatoform disorder by looking at perceived social support in combination with symptom severity. They found a highly significant negative correlation; Meaning a high score on perceived social support was linked to less severity of the somatic symptoms. Therefore, social connectedness seems to have positive results on the mental well-being of people with chronic somatic symptoms.

Secondly, to focus on the dimension rest and recharge, the avoidance-endurance model suggests two strategies related to activity for chronic pain patients: an avoidant strategy, resulting in low activity, and a persistent strategy, focused on persisting through activities (Hasenbring & Verbunt, 2010). Avoiders tend to act passively when they think an activity will be painful. Persisters will act in the opposite way, by going through with an activity despite the expected increase in pain. To increase daily functioning, the model suggests a combination of low persistence and low avoidance, by minimizing limitations (Huijnen et al., 2011). Taking account of this typology, it is possible that if people report a higher symptom severity the rest and recharge soothing factor is likely to have a small positive effect on one's mental well-being. However, if people have less symptoms, they might not benefit from resting. Avoiders will not experience the same progress as persisters, research shows that graded exercise therapy is an effective treatment for CFS (Whiting et al., 2001). Using this therapy patients focus on gradually increasing exercises. The lower the symptoms of the patient, the higher the chance of success. This further substantiates the idea that resting could hinder the improvement when people experience less symptoms, and that people with higher symptom severity benefit less from persisting through their symptoms.

Thirdly, autonomy, relatedness and competence are all positive related to emotional well-being (Reis et al., 2000). People with chronic diseases that focus on coping with their illness, have higher levels of self-rated health, and lower levels of distress and fatigue (Lorig et al., 1999). This indicates that learning people to cope with their illness, giving them a sense of autonomy, which might improve their symptom severity. Focusing on coping with severe symptoms, can be seen as a positive mindset/attitude despite the chronic symptoms. People that tend to have catastrophic believes about CFS, report higher levels of fatigue and inability to work (Petrie et al., 1995).

The current study aims to investigate whether and which soother dimensions can be distinguished in patients with chronic fatigue syndrome, whether and to what extent these dimensions are correlated with mental well-being and symptom severity, and whether soothers are able to moderate (buffer) the association between symptom severity and mental well-being.

Based on previous literature hypotheses were made. Firstly, it is expected that the soothers can be distinguished into up to nine dimensions (see Table 1). Secondly, it is expected that higher scores on symptoms severity positively correlate with lower mental well-being. Thirdly, it is expected that ''*social connectedness*'' correlates positively with mental well-being. There is no interaction expected. Also, a higher score on ''*rest and recharge*'' is expected to correlate with lower mental well-being and more severer symptoms. Moreover, a lower score on rest and recharge is expected to be linked to higher mental well-being, even more so when people report lower symptom severity. Next to that, '*'autonomy and positive mindset*'' is believed to be of importance. A high score on autonomy and positive mindset is expected to be linked to higher mental well-being. See Table 1 for the explanation of the interaction effect of the soother dimensions.

Table 1.

The previous determined nine soothing clusters from Geenen, et al. (2020) with current expectations.

SOOTHER DIMENSION	MAIN EFFECT	INTERACTION
SOCIAL CONNECTEDNESS	Positive	None
REST AND RECHARGE	Negative	'Rest and recharge' is expected to act as a moderator. A high score on rest and recharge, combined with a low score on symptom severity will indicate lower mental well-being compared to a low score on rest and recharge. However, a high score on rest and recharge might result in higher mental well-being when combined with severe symptoms.
VALIDATION	?	?
PLEASANT SURROUNDINGS	?	?
AUTONOMY AND POSITIVE MINDSET	Positive	None
PROFESSIONAL CARE	?	?
ME TIME	?	?
LEISURE ACTIVITY	?	?
SPIRITUALITY	?	?

Note. The main effects present the association between the specific dimension and mental well-being. The interaction explains the way this dimension interacts with mental well-being and symptom severity. A question mark means no concrete effect is expected.

2. Methods

2.1 Procedure and participants

This study uses an observational and cross-sectional design. Approval of the current study was given by the Ethics Committee of the Faculty of Social and Behavioural Sciences of Utrecht University (20-0295). An online questionnaire was used to investigate the scores of participants to determine their mental health, symptom severity and individual scores on the different soother items.

The data-collection was done via the Internet. Qualtrics was used to make an online questionnaire. Social media and various national and regional patient organisations were used to reach the participants. Inclusion criteria were 18 years or older, and Dutch speaking, combined with one of the following disorders: chronic fatigue syndrome; a rheumatic disorder (e.g., fibromyalgia) or irritable bowel syndrome. The link to the questionnaire was presented along with a short introduction to the study. People could participate by clicking on the presented link. At the start of the questionnaire an informational letter was presented along with the informed consent, which stated that participating was on voluntary base. Thus, participants had the right to quit at any time and the results would be confidential. After agreeing with the informed consent, the questionnaire started. First, the following demographics were asked: sex, age, educational attainment, marital status, type of disorder, who diagnosed you, other disorders/diseases. The questionnaire was completed in the following order: RAND SF-36; PHQ-15-NL; 40 Soothers. Completing the questionnaire took about 30 minutes. Data from both participants with CFS and fibromyalgia were used, due to their overlap and data from CFS alone was insufficient. Severe fatigue at a level of chronic fatigue syndrome occurs in 82% of people with fibromyalgia (Overman et al., 2015).

2.2 Instruments

Symptom severity

The Dutch version of the PHQ-15 (Kroenke et al., 2002) was used to determine the somatic symptom severity of the last four weeks. Fifteen individual symptoms were presented and rated on a three-point Likert scale, ranging from 1 (not at all) to 3 (a lot), indicating the severity of the symptoms in the past four weeks. The total score was found by the sum the fifteen questions. The cut-off scores for the PHQ-15 were minimal (0-4), low (5-9), medium (10-14) and high (>15) somatic symptom severity, compared to a total score range of 30 (Kroenke et al., 2002). The PHQ-15 was reliable and valid, with a test-retest reliability of Cronbach's alpha (α) of .80

(van Ravesteijn et al., 2009). Cronbach's alpha in the current study, including people with severe somatic symptoms (thus, a restriction of range), was .67. Which can be interpreted as satisfactory (Taber, 2017).

Mental well-being

The Dutch version of the RAND-36 (VanderZee et al., 1996) was used to measure mental well-being. That questionnaire consists of 36 items focusing on eight dimensions: physical functioning, social functioning, role limitations (physical and emotional), vitality, mental health, general health perception and pain. The RAND-36 is considered to be reliable and valid, and therefore used in this study. Almost all dimensions scored $\alpha > 0.81$ on internal consistency, with the exception of social functioning ($\alpha = .71$) (VanderZee et al., 1996). For the current study only the dimensions reflecting mental well-being were used: Mental health, Role emotional, Vitality, and Social functioning. To determine the mental health composite score, Hay's scoring method was used. (Hays, Prince-Embury & Chen, 1998). The general population scores 50 on average, with a standard deviation of 10. The score can range from 11 to 60; a higher score representing a better mental well-being. The Cronbach's alpha (α) in the current study was .81, indicating a fairly high internal consistency (Taber, 2017).

Questionnaire with Soothers

The 40 soothers were based on earlier research by Geenen et al. (2020), where 40 soothing factors were sorted into nine soother clusters by letting participants group the 40 items based on content (see Table 1). The 40 soothers were measured using a 4-point Likert-scale, ranging from 1 (not) to 4 (a lot), indicating to what extent the soothers influenced their life. A higher score indicates a higher influence on their life. The internal consistency of all soothers together in this study was $\alpha = .88$. Which can be considered fairly high (Taber, 2017).

2.3 Data analysis

The computer system Windows and SPSS version 16.0 were used. In this study, a *p* value of < .05 was considered significant for all test results. Missing data was excluded, prior starting the analyses. Missing data consisted of people not finishing all soother questions. Also, only participants that reported to fit in the category of CFS, fibromyalgia, or both were selected. This was followed by computing the descriptive statistics.

To examine whether and which soother dimensions can be distinguished in chronic fatigue syndrome, a principal axis factoring with oblimin rotation was used to derive the factors

of the soothing items. The scree plot, pattern of factor loadings and an eigenvalue criterion of >1 were used to get an indication of the number of factors (Field, 2009). The pattern matrix with factor loadings was used to get insight into the contents of factors and this interpretation was used to decide on the number of factors in combination with internal consistency calculations. Items were excluded when the factor loading was below .40 on a single factor (Peterson, 2000) or greater than .32 on two separate factors or more (Costello & Osborne, 2005). Cronbach's alpha (α) was used to determine the internal consistency of the final factors. Deviations from the normal score distribution were screened. A score of <1.00 or >-1.00 on the skewness of the score distribution was taken to reflect a normal distribution (Bulmer, 1979).

To investigate univariate associations between soothers, mental well-being and symptom severity, a Pearson correlation was conducted. Pearson correlations of gender, education level, marital status, and age with mental well-being were computed to examine whether it was needed to include them as covariates in the analyses. To examine whether the soother dimensions are able to moderate the association between symptom severity and mental well-being, regression analyses were done. All assumptions were met, specifically; linearity, normality, multicollinearity, and homoscedasticity of residuals. The PROCESS Macro Model v3.4 (Hayes, 2017) was used to conduct a moderation analysis, to examine whether soothers, and the interaction of soothers and symptom severity were associated with mental well-being. Variables were centred, and bootstrapping (0 samples) was chosen.

3. Results

3.1 Participants

In total 441 participants participated. The characteristics of the participants are presented in Table 2. In total 116 (26.3%) had CFS and 399 (90.5%) had fibromyalgia. These numbers exceed 100% because some people fit into both categories. The most reported age group was 51-60 (35.6%), followed by 41-50 (26.5%), 31-40 (15%) and 61-70 (12.5%).

3.2 Soother dimensions

A factor analysis was performed on 40 soothing items to determine dimensions summarizing the items. When looking at the Kaiser-Meyer-Olkin measure of sampling adequacy, we see a score of .92. Substantiating the reliability and distinction of the factors found by the factor analysis (Field, 2009). The factor analysis was deemed appropriate (Field, 2009), due to the significant Bartlett's test of sphericity ($X^2 = 6222.81$, p<.001). Table 3 shows the findings of the principal axis factoring for the participants with chronic fatigue syndrome and fibromyalgia.

The scree plot of eigenvalues and the pattern matrix indicated three factors. These factors were labelled: Autonomy & balance, Social connectedness & positive mindset, and Alternative soothers. The labels were invented by the author of this paper, because they did not match the clusters found in earlier work from Geenen et al. (2020).

Seventeen of the 40 items were deleted because those items did not load on any factor. The first factor labelled Autonomy & balance consists of nine items. This factor focused on balance in life (e.g., ''Good balance between activities and relaxation'') and having autonomy of one person's life (e.g., ''Having the freedom to do something in the way I want to do it myself''). The second factor was labelled '' Social connectedness & positive mindset'' consisting of eight items focusing on having positive surroundings and contacts (e.g., ''Surrounded by lovely people''), as well as someone's mental state (e.g., ''Good mood'' and ''Having a positive mindset''). The last factor was labelled Alternative soothers (4 items; e.g., ''Getting a massage'') consisting of items focusing on different ways to calm the body and mind.

Looking at the statistics of the factors. Factors 1 and 2 had a Cronbach's alpha (α) of >.83, which is considered fairly high. Factor 3 had a Cronbach's alpha (α) of .60, which can be interpreted as satisfactory (Taber, 2017).

3.3 Associations of soother dimensions, symptom severity and mental well-being

Pearson correlations were used to determine whether and to what extent the above constructed dimensions correlated with mental well-being and symptom severity. The correlations analyses showed that mental well-being was associated with symptom severity r (411) = -.45, $p < .001$), and Social connectedness & positive mindset (factor 2) r (411) = .15, $p = .002$). Alternative soothers (factor 3) was associated with symptom severity r (411) = .10, $p = .03$). Autonomy & balance (factor 1) was not associated with symptom severity ($p = .39$) or mental well-being ($p = .62$). Social connectedness & positive mindset (factor 2) was not associated with symptom severity ($p = .25$); nor was Alternative soothers (factor 3) associated with mental well-being ($p = .29$).

Table 2

Characteristics of participants with chronic fatigue syndrome (CFS) and/or fibromyalgia.

Age, *category that was reported the most* (%)	51-60 (35.6)
Gender, *n* (%)	
Female	415 (94.1)
Male	25 (5.7)
Other	1 (0.2)
Education level, *n* (%)	
Low	118 (26.8)
Not low	314 (71.2)
Other	9 (2.0)
Marital status, *n* (%)	
Single	109 (24.7)
In a relationship	323 (73.2)
Other	9 (2.0)
Diagnosis, *n* (%)	
Chronic Fatigue Syndrome	116 (26.3)
Fibromyalgia	399 (90.5)
Diagnosis by, *n* (%)	
Medical specialist	404 (91.6)
General practitioner	22 (5.0)
Other health professional	8 (1.8)
Myself	2 (0.5)
Other	5 (1.1)
Severity of physical symptoms (PHQ-15), *mean (SD)*	13.9 (4.0)
Minimal	2 (0.5)
Low	65 (14.7)
Medium	181 (41.0)
High	193 (43.8)
Mental well-being (RAND-36), *mean (SD)*	33.7 (8.8)

Note. (N = 441). The cut-off scores for the PHQ-15: minimal (0-4), low (5-9), medium (10-14) and high (>15).

Table 3

Factor loadings of the original 40 items of the soother questionnaire, percentage of explained variance, internal consistency coefficients (Cronbach's α) and Eigenvalues in participants with (chronic fatigue syndrome (CFS) and/or fibromyalgia.

Items	Factor		
	1	2	3
Autonomy & balance			
15) Calm surrounding	**.76**	.01	-.07
16) Good balance between activities and relaxation	**.66**	<.01	.06
22) To take a rest or a break	**.61**	<-.01	.01
08) Having the freedom to do something in the way I want to do it myself	**.59**	-.03	.07
34) My limits or boundaries	**.59**	.01	.09
33) Secure and trusted environment	**.57**	-.25	-.14
18) Healthy or good nutrition	**.51**	-.13	.01
09) Consistency and structure	**.50**	.01	-.08
01) Mindfulness	**.44**	-.02	.11
36) Sleeping*	.39	.09	.27
21) Relaxation or breathing exercise*	.39	.04	.33
30) Comfortable posture*	.38	-.20	.10
32) Physical activity*	.35	-.17	.05
12) Understanding my disease*	.34	-.12	.19
37) Feeling recognized, understood, respected, loved, liked or important*	.29	-.26	.27
11) Help from other people*	.22	-.21	.17
02) Aids*	.22	-.11	.13
40) Spiritual or religious activity*	.14	-.13	.13
27) Pets*	.13	-.06	.12
Social connectedness & positive mindset			
04) Doing a fun thing with family or friends	-.10	**-.74**	-.03
06) Surrounded by lovely people	.07	**-.71**	-.07
26) Receiving physical affection	.09	**-.52**	.23
05) Leisure activity	.25	**-.51**	-.16
17) Good or positive conversation	.31	**-.48**	.07
20) People in my environment are happy and healthy	.21	**-.48**	-.08
31) Good mood*	.35	**-.45**	.01
23) Intimacy	.12	**-.42**	.19
24) Having a positive mindset	.31	**-.41**	.02
28) Expressing myself to others and knowing that I'm not alone in all of this*	.25	-.32	.22
38) Yummy beverage, eating a treat or smoking a cigarette*	.08	-.28	.06
10) Something cooling*	-.03	-.07	.04
Alternative soothers			
13) Getting a massage	-.09	.02	**.64**
39) Activity in water	-.07	-.13	**.48**
29) Professional help	-.03	-.16	**.48**
19) Alternative medicine	.10	.03	**.46**
07) Warm temperature*	.22	.02	.38
25) Sharing experiences with fellow sufferers*	.05	-.21	.33
35) Nice weather*	.17	-.12	.30

14) Supplements*	.19	-.01	.22
03) Medication reducing symptoms*	.05	.05	.17
Statistics			
Eigenvalue	10.599	1.903	1.789
% explained variance	26.497	4.759	4.473
Cronbach's α	.83	.85	.60

Items in bold were included in the factor

*Items deleted due to a factor loading below .40 or higher than .32 on multiple factors.

3.4 Soother dimensions as a moderator.

The covariates of mental well-being or symptom severity were determined using a pearson's correlation coefficients, including age, gender, educational level, and marital status. The analyses showed that age ($r = .10$, $p = .046$) and marital status ($r = .10$, $p = .047$) were significantly correlated with mental well-being. There was no significant correlation found for gender ($p = -.04$) or educational level ($p = .06$). Therefore, only age and relationship status were included in the regression analyses as a covariate.

To test whether soothers were indicated to be able to moderate (buffer) the association between symptom severity and mental well-being, a moderation analysis was used. The results are shown in Table 4. The main effect for symptom severity was significant, indicating a higher symptom severity was associated with lower mental well-being (B = -.93, $t(441) = -9.98$, $p <$ .001). The main effect for Autonomy & balance (factor 1) was not significant (B = -.45, $t(441)$ = -.72, $p = .47$). However, the interaction effect was significant (B = .49, $t(441) = 3.22$, $p =$ .001), meaning that the association between symptom severity and mental well-being was moderated by Autonomy & balance (factor 1) (see figure 1). The association between symptoms severity and low mental well-being was stronger for people with low than high scores on Autonomy & balance. The control variable ''single'' was significant ($p = .03$). Indicating that being single was negatively associated with mental well-being. Other control variables were not found to be significant.

For Social connectedness & positive mindset (factor 2) the results are shown in Table 5, and Figure 2 shows a visual representation of the interaction. The association of Social connectedness & positive mindset (factor 2) with mental well-being was significant (B = 1.47, $t(441) = 2.34$, $p = .019$), indicating a higher score on Social connectedness & positive mindset was associated with a higher score on mental well-being. The interaction was not significant (B = .05, $t(441) = .35$, $p = .72$). The control variables were not significant.

The interaction for Alternative soothers (factor 3) and mental well-being was not significant ($p = .68$), nor was the interaction ($p = .34$). Results are shown in Table 6, along with

a visual presentation of the interaction in Figure 3. Only the control variable ''single'' was significant (p = .04). Indicating that being single had a negative effect on mental well-being.
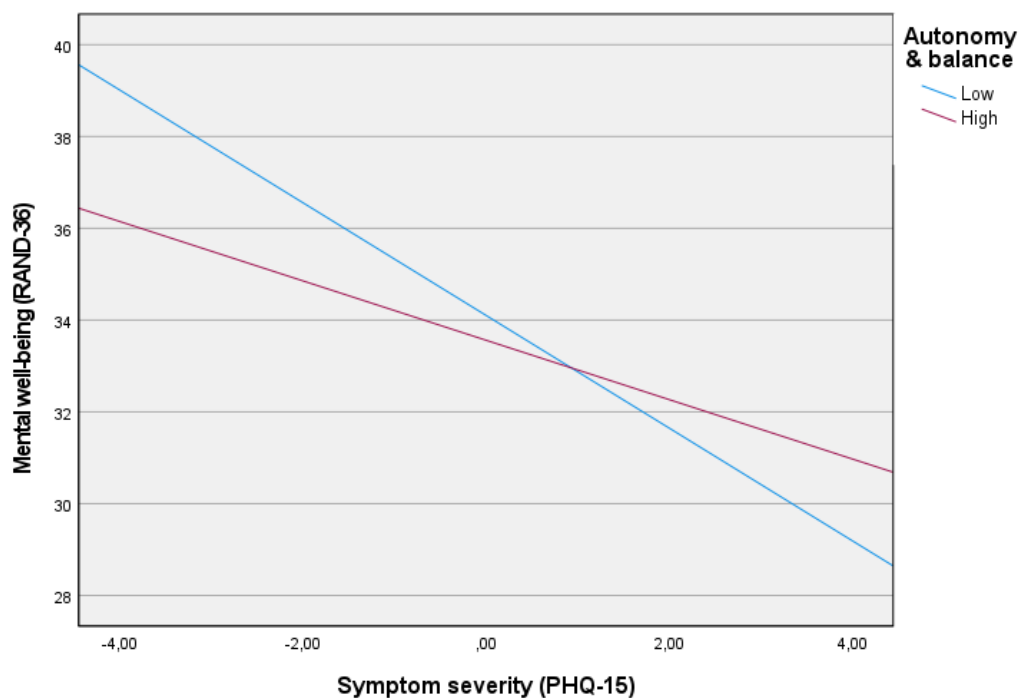
Table 4

Linear model of Autonomy & balance (factor 1) and other variables associated with mental well-being.

	B		SE B	t	p
Constant	34.20	[33.28, 35.12]	.46	73.13	< .001
Total PHQ	-.93	[-1.12, -.75]	.09	-9.98	< .001
Autonomy & balance	-.45	[-1.70, -.78]	.63	-.72	.47
Interaction	.49	[.19, .78]	.15	3.22	.001
Young	-1.56	[-4.38, 1.24]	-1.56	-1.09	.27
Old	-1.79	[-.25, 3.83]	1.79	1.72	.08
Single	-1.78	[-3.47, -.08]	.86	-2.06	.04
Other	-4.13	[-9.36, 1.09]	2.66	-1.55	.12

Note. R^2 = .23. Young = age <30, Old = age >60. Other = not in a relationship nor single. Total PHQ = measurement used for symptoms severity.

Figure 1

Visual representation of the interaction between symptoms severity and mental well-being moderated by Autonomy & balance (factor 1).

Note. The blue line represents -1SD from the mean of Autonomy & balance. The red line a +1SD from the mean of Autonomy & balance.
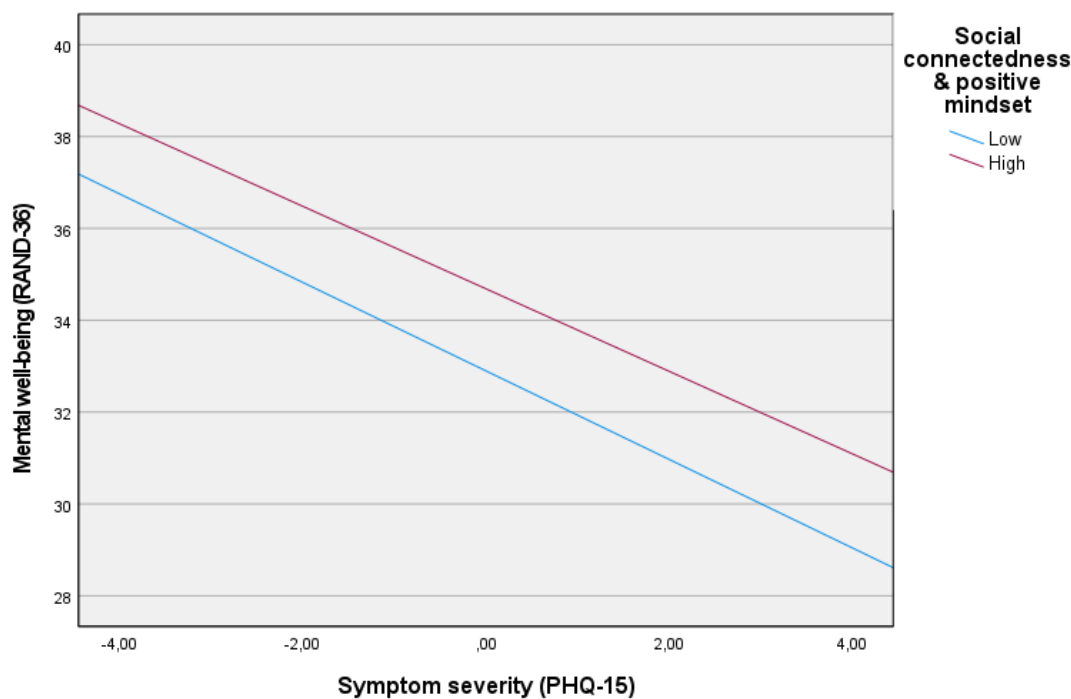
Table 5

Linear model of Social connectedness & positive mindset (factor 2) and predictors of mental well-being

	B		SE B	t	p
Constant	34.14	[33.21, 35.06]	.47	72.63	< .001
Total PHQ	-.93	[-1.11, -.74]	.09	-9.86	< .001
Social connectedness & positive mindset	1.47	[.23, 2.71]	.62	2.34	.019
Interaction	.05	[-.24, .35]	.15	.35	.72
Young	-1.21	[-4.04, 1.61]	1.43	-.84	.39
Old	-1.17	[-.90, 3.25]	1.05	1.11	.26
Single	-1.48	[-3.19, .22]	.87	-1.70	.09
Other	-3.55	[-8.80, 1.69]	2.66	-1.33	.18

Note. $R^2 = .23$. Young = age <30, Old = age >60. Other = not in a relationship nor single. Total PHQ = measurement used for symptoms severity.

Figure 2

Interaction between symptoms severity and mental well-being moderated by Social connectedness & positive mindset (factor 2).

Note. The blue line represents -1SD from the mean of Autonomy & balance. The red line a +1SD from the mean of Autonomy & balance.

Table 6

Linear model of Alternative soothers (factor 3) and predictors of mental well-being

	B		SE B	t	p
Constant	34.12	[33.19, 35.05]	.47	72.02	< .001
Total PHQ	-.92	[-1.11, -.73]	.09	-9.68	< .001
Alternative soothers	-.19	[-1.16, .77]	.49	-.40	.68
Interaction	.11	[-.12, .34]	.12	.93	.34
Young	-1.52	[-4.36, 1.31]	1.44	-1.05	.29
Old	1.65	[-.40, 3.70]	1.04	1.57	.11
Single	-1.77	[-3.48, .05]	.87	-2.02	.04
Other	-3.57	[-8.85, 1.70]	2.68	-1.33	.18

Note. R^2 = .22. Young = age <30, Old = age >60. Other = not in a relationship nor single. Total PHQ = measurement used for symptoms severity.

Figure 3

Interaction between symptoms severity and mental well-being moderated by Alternative soothers (factor 3).
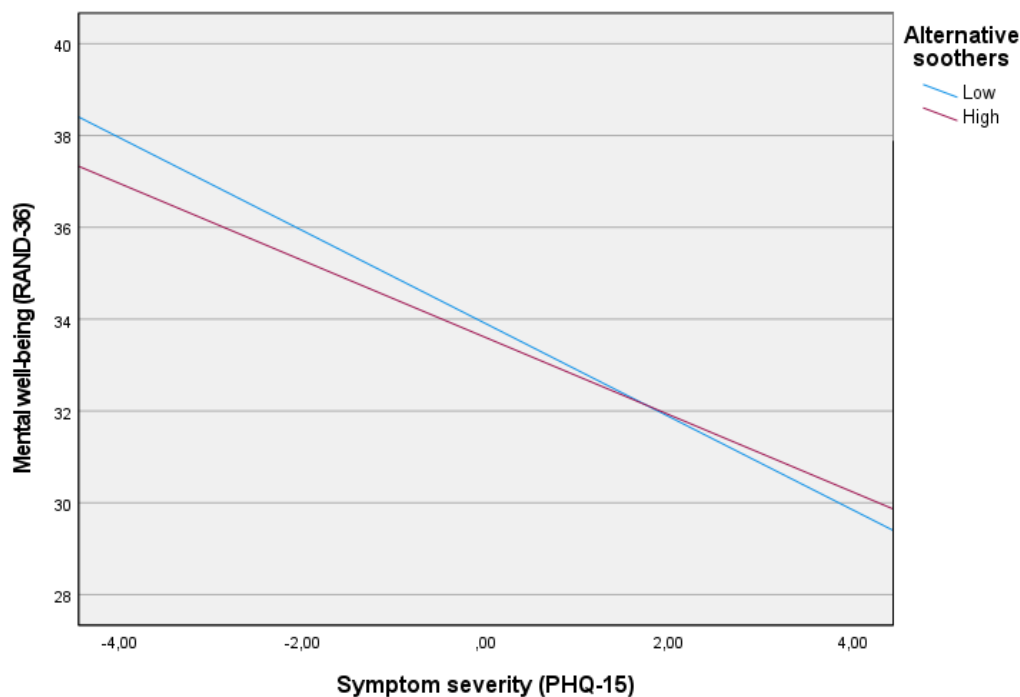
Note. The blue line represents -1SD from the mean of Autonomy & balance. The red line a +1SD from the mean of Autonomy & balance.

4. Discussion

The current study aimed to investigate whether and which soother dimensions can be distinguished in patients with CFS, whether and to what extent these dimensions are correlated with mental well-being and symptom severity, and whether soothers are able to moderate (buffer) the association between symptom severity and mental well-being. In total three dimensions were found, which were labelled as: Autonomy & balance (consisting of nine items), Social connectedness & positive mindset (consisting of eight items), and Alternative soothers (consisting of four items). An association between symptom severity and mental well-being was found. Social connectedness & positive mindset was associated with mental well-being and Alternative soothers was associated with symptoms severity. There was only one moderating interaction found. Here, Autonomy & balance interacted the association between symptoms severity and mental well-being; The association between symptoms severity and low mental well-being was stronger for people with low than high scores on Autonomy & balance. A higher score on Social connectedness & positive mindset was related to a higher score on mental well-being regardless of the symptom severity.

The soother dimensions found in this study seem to share some overlap with the expected dimensions (Table 1). The number of dimensions on the basis of clusters was reduced from nine to three. This reduction is the result of almost half of the items fitting multiple factors or none. Furthermore, the items of ''rest & recharge'' were integrated with ''autonomy & positive mindset'' creating Autonomy & balance. ''Social connectedness'' was integrated with ''autonomy & positive mindset'' creating Social connectedness & positive mindset.

Although the dimensions changed, the expected effects (Table 1) were in line with the results. The expected positive influence of social connectedness on mental well-being (Adams & Turk, 2015; Schoofs et al., 2004) was combined with the expected positive effects of being able to cope with a chronic disease (which can be seen as a positive mindset) (Lorig et al., 1999; Petrie et al., 1995). These two positive effects on mental well-being were found in the positive effect of Social connectedness & positive mindset on mental well-being regardless of the severity of the symptoms (see Figure 2). This is in line with the findings of Gilbert et al. (2008) suggesting that the safe/content factors (soothers) are rooted in social experiences and attachment styles. Current findings further substantiate the importance of social connectedness and a positive mindset for people with CFS and comparable chronic somatic symptoms.

Next on, it was expected that ''rest and recharge'' would have a moderating effect on mental well-being and symptoms severity, based on the avoidance-endurance model

(Hasenbring & Verbunt, 2010). As mentioned earlier, the dimension Autonomy & balance can be seen as a combination of ''autonomy and positive mindset'' and ''rest and recharge''. The interaction expected for ''rest and recharge'' could be found in the interaction of Autonomy & balance. People with a high score on Autonomy & balance want to have control over their lives and take balanced rest. It includes items such as 'taking a rest or a break' and 'calm surrounding'. Keeping the avoidance-endurance model (Hasenbring & Verbunt, 2010) in mind, these people could be categorized as avoiders. While a low score on Autonomy & balance suggested people benefit less from taking rest and having control over their life, this could be categorized as persisters. The data substantiated the idea that being persistent, while suffering from severe symptoms could worsen one's mental well-being. While being persistent could improve one's mental well-being when suffering from less symptoms. This is in line with the study of Whiting et al. (2001) suggesting that CFS patients with lower symptoms have a higher chance of success when being treated with graded exercise therapy than patients with severe symptoms. Furthermore, it appears that being avoidant can be helpful for your mental well-being, while suffering from severe symptoms. While this could be linked to lower mental well-being when suffering from less symptoms. This is also in line with the results of graded exercise therapy (Whiting et al., 2001), suggesting better results when suffering from less symptoms.

The expected main effects for ''autonomy and positive mindset'' and ''rest and recharge'' were not found, this could be explained by the opposing expectations for both, because they were combined into one dimension. Since autonomy was expected to be related to better mental well-being (Reis et al., 2000), but being neither avoidant (a high score on ''rest and recharge'') nor persistent (a low score on ''rest and recharge'') with better daily functioning (Huijnen et al., 2011). Combining these ideas would not result in a concrete expectation for a main effect. The findings could propose an interesting idea within clinical practice, as people suffering from more severe symptoms might benefit more from finding balance and a sense of autonomy in their life than from graded exercise therapy.

The strength of this study lies in the big sample size of patients with CFS and related chronic somatic symptoms, resulting in more power to examine and interpret the findings. Therefore, the findings of this study are of importance and could be used to further investigate soothing dimensions of people with CFS or chronic somatic symptoms. Making the step into research for clinical practice implications easier.

Nonetheless, Some limitations were present in the current study and are important to note. First, the cross-sectional study design did not allow for causal conclusions, thus the directions for the interactions that were found should be investigated further. Second, all

participants were from the Netherlands and they were mainly female, which means that further research is necessary to generalize the findings to multiple populations.

Future research can use this study's findings. Clinical experimental studies can focus on making changes in the soothing dimensions found in this study to see how they can impact mental well-being and/or symptoms severity over time as has been suggested for fibromyalgia (Pinto, Geenen, Castilho et al., 2020). Furthermore, the threat system could be the focus of future research to combine the soothing system and threat system to examine if optimizing both constructs and dimensions could improve mental well-being further than the soothing system on its own. Clinical practice research could use the found dimensions in this study to examine the soothing dimensions that are important to a CFS patient, resulting in a better focus for clinical help as well as opening up conversation for shared decision making to define treatment goals. Making it possible to test a more personalized approach using soothing dimensions in clinical practice.

The current study investigated the dimensions found for soothing factors for patients with CFS and similar chronic somatic symptoms. Specifically looking at the correlations with mental well-being and symptoms severity, this adds to the idea of promoting positive influences, rather than decreasing negative symptoms. Therefore, this study has broadened the scope of CFS research and clinical practice to the importance of soothing dimensions within CFS.

References

Bulmer, M. G. (1979). *Principles of statistics*. Dover Publications.

Clauw, D. J., Essex, M. N., Pitman, V., & Jones, K. D. (2019). Reframing chronic pain as a disease, not a symptom: rationale and implications for pain management. *Postgraduate Medicine, 131*(3), 185–198. https://doi.org/10.1080/00325481.2019.1574403

Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation, 10*(1), 1–9. https://doi.org/10.7275/jyj1-4868

Das, S., Mandal, U. S., Nath, S., & Mondal, A. (2020). Relationship between perceived social support and severity of symptoms in persons with somatoform disorder. *Journal of Evolution of Medical and Dental Sciences*, *9*(06), 320–323. https://doi.org/10.14260/jemds/2020/73

Estévez-López, F., Castro-Marrero, J., Wang, X., Bakken, I. J., Ivanovs, A., Nacul, L., Sepúlveda, N., Strand, E. B., Pheby, D., Alegre, J., Scheibenbogen, C., Shikova, E., Lorusso, L., Capelli, E., Sekulic, S., Lacerda, E., & Murovska, M. (2018). Prevalence and incidence of myalgic encephalomyelitis/chronic fatigue syndrome in Europe—the Euro-epiME study from the European network EUROMENE: a protocol for a systematic review. *BMJ Open*, *8*(9), e020817. https://doi.org/10.1136/bmjopen-2017-020817

Field, A. (2009). *Exploratory factor analysis. Discovering statistics using SPSS* (3rd ed.). SAGE Publications.

Geenen, R., Overgaauw, E., Papi, R., Reerds, Z.E.C., Schelwald, R., Pino, T., Anagnostaki, E., & Prent, Y. (2020). Bedreigende en kalmerende invloeden bij fibromyalgie. *FES Magazine,* 35(190), 26-29.

Gilbert, P. (2016). *Human nature and suffering*. Taylor & Francis.

Gilbert, P., McEwan, K., Mitra, R., Franks, L., Richter, A., & Rockliff, H. (2008). Feeling safe and content: A specific affect regulation system? Relationship to depression, anxiety, stress, and self-criticism. *The Journal of Positive Psychology*, *3*(3), 182–191. https://doi.org/10.1080/17439760801999461

Gilbert, P., & Procter, S. (2006). Compassionate mind training for people with high shame and self-criticism: overview and pilot study of a group therapy approach. *Clinical Psychology & Psychotherapy*, *13*(6), 353–379. https://doi.org/10.1002/cpp.507

Hasenbring, M. I., & Verbunt, J. A. (2010). Fear-avoidance and endurance-related responses to pain: new models of behavior and their consequences for clinical practice. *The Clinical Journal of Pain*, *26*(9), 747–753. https://doi.org/10.1097/ajp.0b013e3181e104f2

Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis, second edition: A regression-based approach (Methodology in the Social Sciences)* (2nd ed.). The Guilford Press.

Hays, R. D., Prince-Embury, S., & Chen, H. Y. (1998). *Rand-36 Health Status Inventory*. Psychological Corporation.

Huijnen, I. P. J., Verbunt, J. A., Peters, M. L., Smeets, R. J. E. M., Kindermans, H. P. J., Roelofs, J., Goossens, M., & Seelen, H. A. M. (2011). Effects of self-discrepancies on activity-related behaviour: Explaining disability and quality of life in patients with

chronic low back pain. *European Journal of Pain*, *15*(7), 748–755.
https://doi.org/10.1016/j.ejpain.2010.11.015

Ingram, R. E., & Snyder, C. R. (2006). Blending the good with the bad: Integrating positive
psychology and cognitive psychotherapy. *Journal of Cognitive Psychotherapy*, *20*(2),
117–122. https://doi.org/10.1891/jcop.20.2.117

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

Lorig, K. R., Sobel, D. S., Stewart, A. L., Brown, B. W., Bandura, A., Ritter, P., Gonzalez, V.
M., Laurent, D. D., & Holman, H. R. (1999). Evidence suggesting that a chronic
disease self-management program can improve health status while reducing
hospitalization. *Medical Care*, *37*(1), 5–14. https://doi.org/10.1097/00005650-
199901000-00003

Meyer, B. (2001). Coping with severe mental illness: Relations of the brief COPE with
symptoms, functioning, and well-Being. *Journal of Psychopathology and Behavioral
Assessment*, *23*(4), 265–277. https://doi.org/10.1023/a:1012731520781

Overman, C. L., Kool, M. B., Da Silva, J. A. P., & Geenen, R. (2015). The prevalence of
severe fatigue in rheumatic diseases: an international study. *Clinical Rheumatology*,
35(2), 409–415. https://doi.org/10.1007/s10067-015-3035-6

Olsson, L. E., Jakobsson Ung, E., Swedberg, K., & Ekman, I. (2012). Efficacy of person-
centred care as an intervention in controlled trials - a systematic review. *Journal of
Clinical Nursing*, *22*(3–4), 456–465. https://doi.org/10.1111/jocn.12039

Peterson, R. A. (2000). A meta-analysis of variance accounted for and factor loadings in exploratory factor analysis. *Marketing Letters*, *11*(3), 261–275. https://doi.org/10.1023/a:1008191211004

Petrie, K., Moss-Morris, R., & Weinman, J. (1995). The impact of catastrophic beliefs on functioning in chronic fatigue syndrome. *Journal of Psychosomatic Research*, *39*(1), 31–37. https://doi.org/10.1016/0022-3999(94)00071-c

Pinto, A. M., Geenen, R., Castilho, P., & da Silva, J. A. P. (2020). Progress towards improved non-pharmacological management of fibromyalgia. *Joint Bone Spine*, *87*(5), 377–379. https://doi.org/10.1016/j.jbspin.2020.02.005

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. *Preprints*, 1–27. https://doi.org/10.20944/preprints202007.0224.v1

Price, J. R., Mitchell, E., Tidy, E., & Hunot, V. (2008). Cognitive behaviour therapy for chronic fatigue syndrome in adults. *Cochrane Database of Systematic Reviews*, 1–67. https://doi.org/10.1002/14651858.cd001027.pub2

Reis, H. T., Sheldon, K. M., Gable, S. L., Roscoe, J., & Ryan, R. M. (2000). Daily well-being: The role of autonomy, competence, and relatedness. *Personality and Social Psychology Bulletin*, *26*(4), 419–435. https://doi.org/10.1177/0146167200266002

Stulemeijer, M., de Jong, L. W. A. M., Fiselier, T. J. W., Hoogveld, S. W. B., & Bleijenberg, G. (2004). Cognitive behaviour therapy for adolescents with chronic fatigue

syndrome: randomised controlled trial. *BMJ*, *330*(7481), 14–21.

https://doi.org/10.1136/bmj.38301.587106.63

Symptoms of ME/CFS | Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS) |

CDC. (n.d.). Center for Disease Control. Retrieved 3 December 2020, from

https://www.cdc.gov/me-cfs/symptoms-diagnosis/symptoms.html

Taber, K. S. (2017). The Use of Cronbach's Alpha When Developing and Reporting Research

Instruments in Science Education. *Research in Science Education*, *48*(6), 1273–1296.

https://doi.org/10.1007/s11165-016-9602-2

van Middendorp, H., Geenen, R., Kuis, W., Heijnen, C. J., & Sinnema, G. (2001).

Psychological adjustment of adolescent girls with chronic fatigue syndrome.

Pediatrics, *107*(3), 1–8. https://doi.org/10.1542/peds.107.3.e35

van Ravesteijn, H., Wittkampf, K., Lucassen, P., van de Lisdonk, E., van den Hoogen, H., van

Weert, H., Huijser, J., Schene, A., van Weel, C., & Speckens, A. (2009). Detecting

somatoform disorders in primary care with the PHQ-15. *The Annals of Family*

Medicine, *7*(3), 232–238. https://doi.org/10.1370/afm.985

Westbrook, J. I., Talley, N. J., & Westbrook, M. T. (2002). Gender differences in the

symptoms and physical and mental well-being of dyspeptics: A population based

study. *Quality of Life Research*, *11*(3), 283–291.

https://doi.org/10.1023/a:1015239020403

Whiting, P., Bagnall, A.-M., Sowden, A. J., Cornell, J. E., Mulrow, C. D., & Ramírez, G.

(2001). Interventions for the treatment and management of chronic fatigue syndrome.

JAMA, *286*(11), 1360. https://doi.org/10.1001/jama.286.11.1360

Wiborg, J. F., Knoop, H., Stulemeijer, M., Prins, J. B., & Bleijenberg, G. (2010). How does cognitive behaviour therapy reduce fatigue in patients with chronic fatigue syndrome? The role of physical activity. *Psychological Medicine*, *40*(8), 1281–1287. https://doi.org/10.1017/s0033291709992212

Zautra, A. J., Fasman, R., Parish, B. P., & Davis, M. C. (2007). Daily fatigue in women with osteoarthritis, rheumatoid arthritis, and fibromyalgia. *Pain*, *128*(1), 128–135. https://doi.org/10.1016/j.pain.2006.09.004

VanderZee, K. I., Sanderman, R., Heyink, J. W., & deHaes, 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. https://doi.org/10.1207/s15327558ijbm0302_2