Subjective Well-Being in Fibromyalgia

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Chapter 1: Thesis Overview

This chapter aims to provide an overview of the dissertation presented here as a whole. It outlines the purpose, content and organisation of the following literature review (chapter 2) and empirical paper (chapter 3). This chapter also intends to show how the two main chapters fit together, and how they represent important research within the wider literature.

Fibromyalgia (FM) is a chronic pain syndrome characterised by pain in the soft tissues of the body, general fatigue and sleep disturbance (Wolfe *et al.*, 1990). Many individuals face a long and difficult journey to receive a diagnosis of FM. A recent survey reported that on average, respondents waited 2.3 years and saw 3.7 physicians before receiving a diagnosis of FM (Choy *et al*., 2010). Furthermore, individuals with FM have also reported that there is a considerable stigma associated with having the condition. In one qualitative study, women with FM reported feeling that others, including their physicians, questioned their credibility when reporting symptoms and their work ethic; and also implied that their illness was entirely psychological. As a result, the women reported that they coped with these difficulties either by withdrawing from social activity to avoid such experiences, or by putting on a façade that masked the true extent of their suffering (Asbring & Narvanen, 2002).

Current medical and psychological treatments for FM are limited in success with regards to providing consistent benefits to the FM population as a whole (Abeles, Solitar, Pillinger & Abeles, 2008; Vlaeyen & Morley, 2005). Traditionally the dominant approach to intervention within both the medical and psychological fields is to focus on the reduction of negative symptoms. In contrast, the growing field of positive psychology continues to demonstrate the utility of exploring the processes and conditions that are conducive to optimal human functioning (Seligman & Csikszentmihalyi, 2000) as an alternative or complimentary approach to conventional methods of healthcare. Subjective well-being (SWB) can be defined as *"a person's cognitive and affective evaluations of his or her life"* (Diener, Lucas & Oishi, 2002, p.63). A large body of evidence suggests that individuals who have

higher SWB enjoy a range of positive outcomes, including health-related benefits (e.g. Deiner & Chan, 2011).

The application of a positive psychology approach may be particularly relevant to FM, where there is growing evidence of a specific deficit in positive affect (PA), a major component of SWB. Chapter 2 of this thesis is a systematic review of the literature regarding PA in individuals with FM. It focuses on the quantitative literature and specifically aims to answer the question: is there a deficit in PA in individuals with Fibromyalgia relative to other pain conditions, general health conditions, and also the general population?

The literature review begins by giving a rationale as to why exploring the evidence for a deficit in PA specific to the FM population is important. It also summarises the background literature regarding the structure of affect, as well as theories relating to the potential function, and proposed mechanism of action, of PA. Next, the method section outlines the systematic methods that were used to identify the relevant studies that are included in the review. This is followed by the results section, which succinctly presents a synthesis of the characteristics of the included studies, along with the key findings regarding PA. The discussion section considers how the findings answer the question of whether there is a specific deficit in PA within the FM population. It also considers the clinical implications of the findings. This is followed by an in-depth discussion of the potential limitations of the review, in terms of both the quality of the studies included and also the methodological considerations of the review process itself. Finally, recommendations for future research are made.

It has been hypothesised that hope is a major contributor to well-being (Snyder, 2002). In non-clinical samples, the association between hope, particularly goal-focused hope, and SWB has been well documented (e.g. Snyder, 2002). More recently, mindfulness has also been identified as promoting increased SWB (e.g. Brown & Ryan, 2003). Chapter three of this thesis is an empirical paper that aims to add to the current literature by exploring the specific impact SWB has on improving FM-related symptoms and difficulties. It also builds on the existing literature in non-clinical samples by investigating if goal-focused hope and mindfulness significantly contribute to the

promotion of SWB within the FM population. To achieve these aims, the research utilises structural equation modelling (SEM) techniques to simultaneously explore the relationships amongst the key study variables. This was done by pre-specifying a hypothesised model of how hope and mindfulness may lead to increased SWB in FM, based on past research. The extent to which this model fit the actual data collected was then examined.

The empirical paper starts by considering the importance of SWB with regards to physical health outcomes. It also introduces the concepts of goal-focused hope and mindfulness, and begins to consider the theory behind how they may lead to higher SWB within the FM population. The method section then gives details of the study's participants, measures and procedures. It also reports how the data was analysed, with a particular focus on a description of SEM. Next, the results section begins with details of how the data was prepared and includes findings from the preliminary analysis. The main focus of this section involves testing the hypothesised SEM model against the study data. Finally, the discussion section reflects on the study's findings within the context of existing research and theory. Potential limitations of the study are considered, as well as the implications for future research and clinical practice. This section is concluded with a succinct summary of the study's key contributions to the literature and how this should inform future work.

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Chapter 2:

Deficits in Positive Affect in Individuals with Fibromyalgia: A Systematic Review[1]

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2.1 Abstract

Individuals with fibromyalgia suffer from a range of symptoms that prove difficult to treat using traditional medical approaches. Recent research has focused on the role that positive affect (PA) may play in the maintenance of fibromyalgia symptoms. This review aimed to appraise the evidence of a specific PA deficit in individuals with fibromyalgia. Online databases were searched systematically to find relevant literature. All included studies were assessed for quality. Twelve studies were identified, totalling 1,075 participants with fibromyalgia. The primary outcome of interest was PA, and the effect sizes of group differences were calculated. Eleven of the 12 studies found that individuals with fibromyalgia reported significantly lower levels of PA when compared to a range of other study populations including individuals with osteoarthritis, rheumatoid arthritis, mixed health conditions, as well as healthy controls. Effect sizes ranged from 0.45 to 1.08, with the majority of effect sizes being medium-to-large. These represent promising findings; however the quality of the studies was affected by poor definition of fibromyalgia and comparison groups, lack of power analyses, failure to adequately control for group differences, and concerns that some of the different study samples may include the same participants. Future research should initially aim to clarify the presence of a specific PA deficit in fibromyalgia through well-controlled, high quality studies. Subsequent research should further explore the underlying mechanisms through which PA affects symptomology in fibromyalgia, as well as the design and evaluation of clinical interventions aimed at improving well-being through cultivating PA.

2.2 Introduction

Fibromyalgia (FM) is a chronic pain syndrome characterised by pain in the soft tissues of the body, general fatigue and sleep disturbance. Prevalence studies suggest that between 2% and 6% of the general population suffer from FM, and that it is far more common in women than in men [3,46]. The pathology of FM remains unknown. Indeed, the diagnostic criteria for FM is widespread pain, occurring for at least three months in the absence of any other explanatory physical cause [72]. Perhaps as a result of this etiological 'mystery' there is currently an absence of any one drug treatment that is reliably beneficial to the FM population as a whole [1].

FM is also marked out from other chronic pain conditions by the high levels of psychological distress frequently reported by those with the condition. Research has consistently indicated that individuals with FM are more likely to report increased levels of psychiatric disorders such as anxiety and depression compared to the general population, and other comparable pain conditions [25,50,58,59]. Not surprisingly then, a number of studies have investigated the efficacy of psychological interventions for FM and the wider chronic pain population. Although research that directly compares the efficacy of pharmacological and psychological interventions is lacking, results from meta-analyses and other reviews have found comparable outcomes [57]. The British Pain Society recommends chronic pain treatment should be multimodal and include a substantial cognitive-behavioural approach [7]. However, as with drug treatments, no single psychological treatment appears to offer consistent benefits to the entire chronic pain population [62]. A more recent development, is the concept of matching service users to particular treatment options based on their baseline characteristics that may influence treatment outcomes [51,62].

It is clear then, that there is much room for improvement in the current understanding of the specific factors that underlie and influence the high levels of pain, disability and distress in FM. Furthermore, improved knowledge of the specific characteristics of individuals with FM which differentiate them from the wider chronic pain population may be useful to match them to the most appropriate interventions.

Although research into the psychological aspects of FM has traditionally focused on relieving negative affective symptoms such as depression, over the last two decades, a number of studies have begun to examine the unique role positive affect may play in FM compared to other pain conditions. Positive affect (PA) in this context refers to the extent to which someone experiences positive mood states such as joy, confidence and alertness [65]. In contrast, negative affect (NA) reflects the degree to which an individual experiences states such as anger, guilt and fear.

There is debate in the literature as to how affect is best understood. One approach is that affect is best conceptualised as a single bipolar dimension with PA at one end and NA at the other [26,52]. The implication being that at any one time an individual can be experiencing PA or NA, but not both. There is, however, substantial evidence that would suggest that this single continuum theory does not adequately explain the experience of PA and NA. Watson and Tellegen [70] proposed a highly influential hierarchical model of affect. According to this theory, lower order specific emotional states (e.g. fear, joy) map onto the two broad high order orthogonal factors of PA and NA, which reflects the overall valence of whether they are negative or positive states. This model states that PA and NA vary largely independently from each other. It is possible, for example, that an individual may experience both high levels of PA (e.g. feeling enthusiastic) and high levels of NA (e.g. feeling nervous) at the same time. There is a considerable body of findings that supports an independent affect factor structure [41,64,66,69]. What is more, when defending their model, Tellegen and colleagues [55] note that PA and NA have differential effects on information processing [40], are associated with different personality traits [9,36,42,67], and have also been linked to different neuropsychological and behavioural activation systems [10,56].

Benefits of Positive Affect

There is evidence that ‘happy’ people enjoy a range of better physical health outcomes, compared to their less happy counterparts. Firstly, there is compelling research that suggests happiness predicts longevity, in that happier people live for longer [16]. Secondly, longitudinal data indicates that PA is also negatively associated with morbidity, the likelihood of an individual

developing health conditions. Diener [15] reports that long-term studies have shown that individuals who experienced more positive emotions are less likely to experience a range of health conditions later in life, including cardiovascular disease, mental health difficulties and alcohol-related liver disease. Lastly, low levels of well-being have been linked with depression [34], which in turn has been consistently associated with poorer outcomes in physical illnesses [43].

For the FM population specifically, there is growing evidence that PA is linked to a range of outcomes. Higher levels of PA have been associated with reduced levels of pain [48,77] as well as increased pain tolerance [21,61], lower levels of negative affectivity [75], increased physical functioning [61] and a reduced risk of psychiatric co-morbidity [28].

Theoretical Mechanisms of Positive Affect

One of the prevailing ideas regarding the value of PA conceptualises it as a psychological resource to be drawn upon during difficult times. This is exemplified by Fredrickson's broaden-and-build hypothesis [24]. From an evolutionary perspective, negative mood states typically occur in situations that are threatening in some way, and that require immediate action to stay safe; for example being confronted by an assailant would produce a fear response triggering 'fight or flight' behaviour [45]. In such circumstances, a narrowed thought-action process is beneficial as it promotes speed of response, and thus increases survival odds. Fredrickson's model argues that in contrast to this, PA typically occurs in non-threatening situations where immediate action is not necessary. As such, positive emotions have the opposite effect to negative ones: they broaden an individual's "*thought-action repertoire*" [45] c expanding the range of thoughts and actions that come to mind. For example, research has demonstrated that the thinking styles of individuals experiencing high levels of PA are more creative, integrative, flexible, efficient and open to new information [20,30-33]. Therefore, those individuals who consistently have higher levels of PA, will cope better during times of stress, such as pain flare ups, as they will have built up a larger wealth of resources to draw from.

More recently, Zautra and colleagues [73,78] have developed the Dynamic Affect model, specifically with the chronic pain population in mind (though applicable to the general population).

Drawing from the aforementioned existing models and theories about the construct and functions of PA and NA, the model accounts for supposed differences in the way PA and NA relate to each other both between and within individuals over time. The Dynamic Affect model proposes that during calm, stress free times, PA and NA work largely independently of each other. At times of low-threat it is beneficial to process both positively- and negatively-valenced information as it allows an individual to access and process the widest range of information available, thus resulting in the most optimal response. However, in line with the evolutionary perspective of NA, at times of increased stress, rapid information processing is preferable, thus an individual's attention is narrowed to immediate threats in order to produce quick action to neutralise the threat. The Dynamic Affect model specifies that at such times, negative information is preferentially attended to over positive information, and thus NA and PA "*fuse*" together into a single bipolar continuum becoming highly inversely related. As the authors propose the purpose of this fusing is to narrow attention to immediate threats, it could be inferred that fusing represents a specific reduction in the processing of positively-valenced information, which may lead to a decrease in PA. What it does not necessarily imply is an increase in the amount of negatively-valenced information leading to increased NA.

The model proposes that everyone will demonstrate within-person changes in affectual processing between times of low and high stress to some extent. However, it also predicts between-person differences such that certain individuals, for example those with chronic pain, are likely to experience the fusing of PA and NA to a greater extent. The authors suggest that for those suffering from chronic pain, the experience of pain is likely to be a frequent stressor. Whilst the Dynamic Affect model is clearly complimentary to the Broaden-and-Build hypothesis in several ways, there are key differences in the predictions it makes regarding how higher PA may help an individual to cope better at times of stress. Specifically, the model would imply that those who are able to maintain higher levels of PA *during* times of stress, such as pain flare ups, will cope better than those with low PA.

Potential Predictors of Positive Affect in Fibromyalgia

A range of psychosocial factors have been identified as potentially influencing PA within the FM population. Unsurprisingly, times of increased pain has been associated with experiencing lower PA [35,49,76,77]. As mentioned earlier, however, increased PA has been associated with experiencing less pain, and also improved pain tolerance [21], indicating that the relationship may be bidirectional to some degree. Also somewhat predictably, an increased number of positive life events has been shown to relate to an increase in PA, though interestingly increased negative events do not seem to predict decreases in PA [44,76]. This is a finding which may support theories that propose NA and PA are largely independent from one another. Lastly, relationships and interpersonal stress appear to play an important role in levels of PA. Zautra and colleagues [75] found that individuals with FM reported steeper declines in PA during weeks of high interpersonal stress compared to individuals with osteoarthritis (OA; a chronic pain condition characterised by inflammation of the joints). Moreover, an earlier study also suggested that individuals with FM were less likely to seek social support at times of stress compared to those with OA [73]. Conversely, Davis *et al.* [11] found that individuals with FM were just as likely to seek social support at times of increased pain as individuals with OA who were awaiting knee surgery, but that individuals with FM had smaller social networks characterised by more negative relationships.

At the neurobiological level, research has indicated the role of the catecholamine and opioid systems in an individual's ability to maintain higher levels of PA [22]. Moreover, wider research suggests that affiliative social relationships can alter an individual's pain threshold, as well as their immune and digestive systems, and that these changes occur through oxytocin-opiate system [14]. Current research links the oxytocin-opiate system to social support in that oxytocin enhances the buffering effect of social support on stress responsiveness [29]. Given that FM is a pain syndrome, and that for individuals with FM lower levels of PA have been linked to increased interpersonal stress, it is possible that this system may be particularly relevant to FM.

Given the burgeoning research interest into potential predictors of PA and outcomes of low/high PA in individuals with FM it is important to be clear if there is a distinct and consistent

deficit in PA in individuals with FM compared to other populations. As such, the purpose of this review is to systematically search and assess the existing literature to answer the question: Is there a deficit in PA in individuals with fibromyalgia relative to other pain conditions, general health conditions, and also the general population?

2.3 Method

Literature Review

The following databases were searched from their inception until April 2014: PsycINFO, PubMed, Scopus, and Web of Knowledge[2]. Search terms were "positive affect" or "positive emotion" and "fibromyalgia". The reference lists of retrieved articles that met inclusion criteria were also searched by hand for additional relevant studies.

Study Selection

All stages of the study selection and data extraction process were completed by the author and a second independent reviewer. Disagreements were resolved through discussion. Potentially eligible studies were first selected on the basis of the title and abstract. Studies were included if they:

a. Included a study sample of individuals with fibromyalgia
b. Investigated PA

Studies were excluded on the following criteria:

a. Individuals with FM were not analysed as an independent sample[3] (e.g. mixed chronic pain groups)
b. There was no control or comparison group

[2] Now known as Web of Science.
[3] This only applied for comparing levels of PA as the variable of interest. Studies that analysed results for combined pain groups were included if they reported statistics on PA separately for FM participants and other sample populations.

c. Sample populations under 18 years of age

d. Non-English language studies

e. Non-peer reviewed work (e.g. unpublished theses)

f. Intervention or experimental design studies[4]

g. Papers that did not report empirical or novel findings e.g. review articles

Data Extraction and Quality Assessment

The following data were extracted from each paper: sample characteristics, how PA was measured, data analysis, mean PA scores for each study sample and the associated standard deviation, and lastly whether significant between-group differences in PA were reported.

A quality assessment of the included studies was also conducted. It proved difficult to find an existing well-validated quality assessment tool for cross-sectional psycho-social studies. As such, the quality of the included studies was appraised using a purpose-designed quality assessment tool that captured the important variables to this review. Based on Newcastle-Ottawa Scale [71] and the STROBE [63], the following areas were assessed:

a. How representative the FM sample was of the wider FM population

b. Whether a power calculation was performed or sample sizes were otherwise justified

c. The quality of the measure of PA

d. How well the study controlled for any potential biases between groups

e. The appropriateness of statistical analysis

The findings of the quality assessment are reported in Table 2, the implications of which are discussed further in the discussion section of this review.

[4] Intervention or experimental manipulation was considered a confounding variable to the natural occurrence of PA within an FM sample.

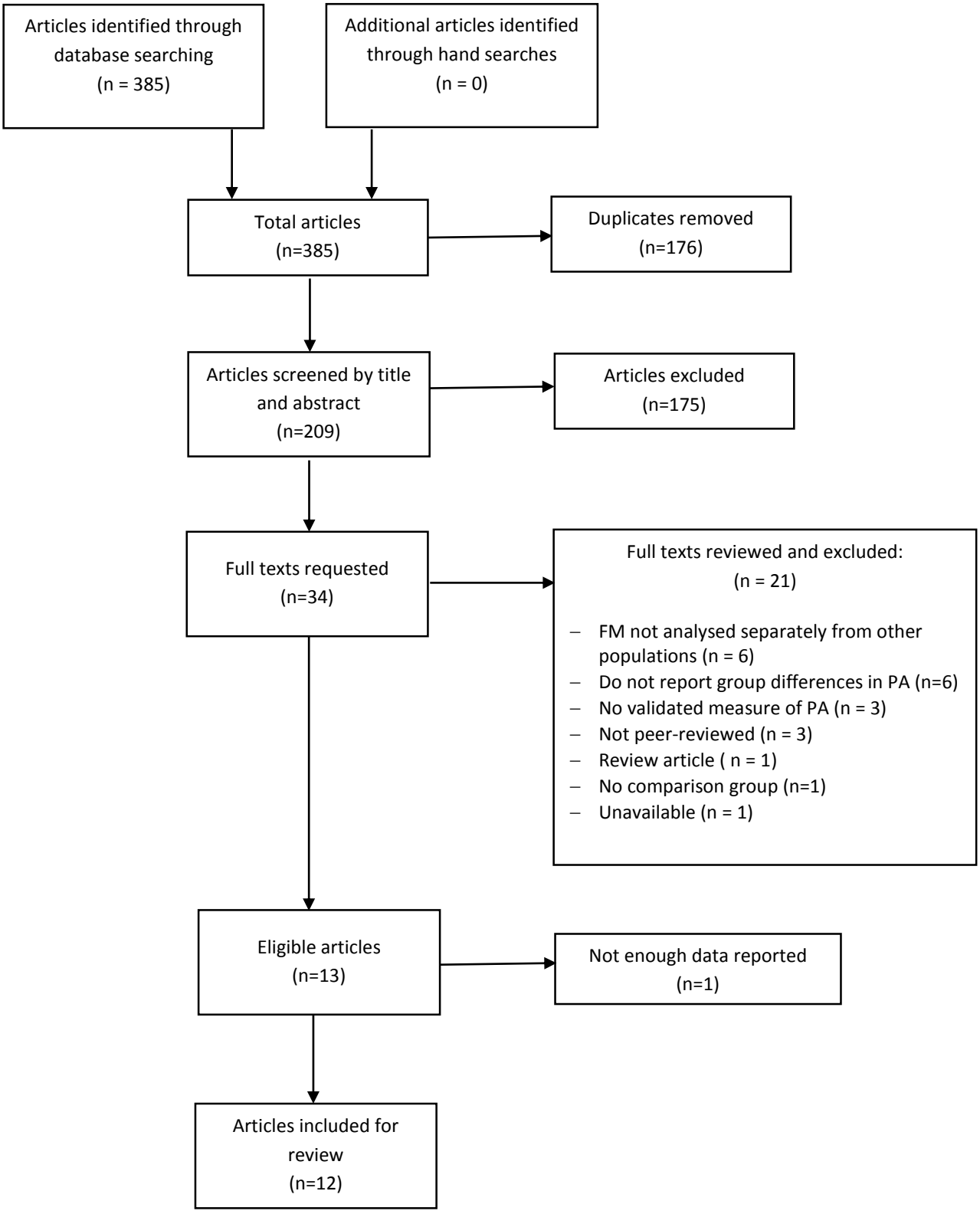

Figure 1. Flow Diagram of Study Selection.

2.4 Results

The literature search retrieved 385 citations (PsycINFO 74, PubMed 75, Scopus 97, Web of Knowledge 139). The initial screening of titles and abstracts revealed that 176 were duplicates and a further 175 were not relevant to the study based on the aforementioned inclusion and exclusion criteria. Full text articles were requested for the remaining 34 citations. Twenty-one were excluded for reasons stated in Figure 1, leaving 13 studies which were eligible for inclusion. During the review process, a further study [2] was excluded. Although the study stated that it found significantly lower PA in women with FM compared to women with rheumatoid arthritis (RA) and healthy women, the paper did not report the group means, standard deviations or any further information regarding data analysis. As such the decision was made to exclude the study due to lack of relevant information, leaving 12 studies included in the review. There was complete agreement between the author and second reviewer about which studies should be included for review.

Study Characteristics

Table 1 summarises the key characteristics of the studies included in the review. FM Sample sizes ranged from 20 to 403, with a total of 1,075 participants with FM. Only 2 of the 12 studies [27,28] included male patients (n=16), representing 1.5% of the FM sample. The overall mean age of the FM sample was 52.81 years (mean age range 40.60 to 62.00 years). Four studies reported the average duration of FM, which ranged from 4.86 years to 13.70 years [27,35,60,76].

Eight studies [11,23,35,47,74-77] included OA comparison samples (total n=404). Of these eight studies, one study [23] included an additional separate sample of individuals with a dual diagnosis of FM and OA (n=101), and one study [11] had an additional separate group of OA participants specifically awaiting knee surgery (n=29). Two studies [22,57] had samples of participants with RA (total n=117), one study [28] reported a heterogeneous physical health sample (e.g. arthritis, Lyme disease, neuropathy; n=92), and the final two studies [4,60] included healthy control groups (HC, n=216).

When assessing PA, eight of the 12 studies used the Positive and Negative Affect Schedule [PANAS, 69]. The PANAS is a 20-item measure, consisting of two subscales that assess PA and NA. Participants are asked to rate the extent to which they have experienced 20 mood adjectives (e.g. interested, afraid) on a scale from 1 (very slightly) to 5 (extremely). A further three studies used the expanded version of this scale, the PANAS-X [68]. The PANAS-X contains the same PA and NA subscales as the PANAS, as well as additional basic emotion subscales. Of the 11 studies that used versions of the PANAS, nine reported group PA scores reflecting participants' average item score (out of 5), whereas the remaining two studies [4,28] reported group PA scores based on participants' total PA subscale scores (out of 50). The final study used the Mood Adjective Checklist [17]. Similar to the PANAS, nine mood adjectives, four PA and five NA, are scored on a 7-point scale from 0 (not at all) to 6 (extreme).

Six of the studies were cross-sectional. The remaining studies measured PA by taking multiple measurements over periods spanning two days to 12 weeks and reported the average PA scores for this period (see Table 1).

Table 1.

Study Characteristics and Outcomes.

Study	PA measure	Study design	Groups	N	Mean age (years)	PA means (SD)	*P*	ES
[4] Becerra-Garcia 2014	PANAS	Cross-sectional	FM HC	20 20	52.59 55.11	22.53 (8.82) [a] 30.30 (5.10) [a]	<.05	1.08
[11] Davis 2001	PANAS	Cross-sectional	FM OA OA surgery	50 22 29	62.00 64.68 64.83	3.05 (0.70) 3.38 (0.79) 3.45 (0.72)	< .05 < .05	0.45 0.60
[23] Finan 2009	PANAS	Longitudinal (30 daily measurements)	FM OA only FM/OA	53 106 101	52.51 59.83 56.74	2.50 (0.80) 2.63 (0.72) 2.29 (0.80)	n.s. (FM vs OA) n.s. (FM vs FM/OA) < .01 (FM/OA vs OA)	- - 0.45
[27] Hamilton 2007	Mood Adjective Checklist	Longitudinal (12 measurements over 2 days)	FM RA	22 27	48.22 53.87	2.22 (0.89) 2.49 (1.05)	n.s.	-
[28] Hassett 2008	PANAS	Cross-sectional	FM Mixed health	79 92	40.60 45.20	29.10 (8.40) [a] 33.80 (6.90) [a]	<.01	0.63
[35] Kratz 2007	PANAS	Longitudinal (10-12 weekly measurements)	FM OA	75 35	54.57 [b]	2.59 (0.57) 3.13 (0.55)	Not stated	0.96
[47] Nicolson 2010	PANAS-X	Longitudinal (30 daily measurements)	FM OA	35 35	53.50 58.40	2.10 (0.60) 2.70 (1.10)	.02	0.68

Table 1.

Study Characteristics and Outcomes.

Study	PA measure	Study design	Groups	N	Mean age (years)	PA means (SD)	*P*	ES
[60] van Middendorp 2008	PANAS-X	Cross-sectional	FM HC	403 196	46.50 45.60	3.17 (0.64) 3.47 (0.51)	<.01	0.50
[74] Zautra 2007	PANAS	Longitudinal (30 daily measurements)	FM OA RA	90 76 89	55.20 59.10 52.30	2.20 (0.60) 2.80 (0.90) 2.80 (0.60)	< .05 < .05	0.80 1.00
[75] Zautra 2005a	PANAS-X	Longitudinal (12 weekly measurements)	FM OA	87 39	52.68 58.87	2.67 (0.77) 3.33 (0.65)	<.01	1.00
[77] Zautra 2005b	PANAS-X	Longitudinal (10-12 weekly measurements)	FM OA	86 38	52.76 59.38	2.78 (0.58) 3.16 (0.55)	<.01	0.67
[76] Zautra 1999	PANAS	Cross-sectional	FM OA	50 52	62.31 65.34	2.84 (0.65) 3.19 (0.66)	<.05	0.53

Note. PANAS (-X) = Positive and Negative Affect Schedule (Expanded); FM = fibromyalgia, OA = osteoarthritis, OA surgery = osteoarthritis patients awaiting knee surgery; RA = rheumatoid arthritis, FM/OA = participants with a dual diagnosis of fibromyalgia and osteoarthritis; HC = healthy controls; Mixed health = group of individuals with a range of different physical health conditions; ES = effect size.

[a] *Denotes mean group PA subscales scores (out of 50). All other studies report mean group PA scores as an average item score (out of 5).*

[b] *Mean age in this study was reported as a single combined mean of the FM & RA groups.*

Evidence for a Positive Affect deficit in Fibromyalgia

Of the eight studies that compared FM and OA samples, seven found that individuals with FM had significantly lower PA compared to those with OA [11,35,47,74-77]. One of these studies also found that individuals with FM reported significantly lower PA compared to individuals with OA who were awaiting knee surgery. The surgery group was specifically included as a third comparison group as it was hypothesised the level of pain reported by this group would be comparable to those with FM (more so than the OA only group). Furthermore, one of the studies using the PANAS-X reported additional findings that that individuals with FM also scored significantly lower on the joviality, self-assurance and attentiveness subscales than individual with OA.

The remaining OA study [23] compared individuals with FM only, individuals with OA only, and individuals with a dual diagnosis FM and OA (FM/OA). This study reported that the FM group did not statistically differ on levels of PA from either the OA only, or the FM/OA groups. However, the FM/OA did report significantly lower PA compared to the OA only.

Two studies compared FM and RA groups. The first also found a significant deficit in PA for individuals with FM [74], whereas the second study did not [27]. Of note, the study that found no significant difference between groups had one of the smallest sample size, and it is unclear which statistical test was used to compare the groups.

Both of the studies that used healthy control samples found that individuals with FM reported significantly lower levels of PA. The study by Becerra-Garcia *et al.* [4] was relatively small with 20 participants in each group. In contrast, van Middendorp and colleagues [60] compared a large FM sample to healthy controls using the PANAS-X. In this study, a conservative p value of .01 was used to account for the large sample and multiple testing. Again, individuals with FM reported significantly lower levels of PA. Moreover, the expanded version of the PANAS also revealed that individuals with FM reported significantly lower joviality and self-assurance compared to the HC control group. There was no group difference for levels of attentiveness.

Lastly Hassett *et al.* [28] found that individuals with FM reported significantly lower levels of PA compared to a heterogeneous control group of individuals with a variety of physical health conditions. Similar to the previous study adjusted p values were calculated where necessary to account for multiple comparisons.

Size of Group Differences

Cohen's *d* Effect Sizes (ESs) were also calculated to assess the magnitude of the deficit in PA for individuals with FM. This was done using the formula proposed by Borenstein and colleagues [6]. One study [23] did not report the Standard Deviation (SD) of the group means which was needed to compute ES, but this was calculated using the reported Standard Error (SE) and sample size.[5] Traditionally, between group ESs are defined according to Cohen's [8] classification; where ES of 0.2, 0.5 and 0.8 represent small, medium and large group differences respectively. Table 1 shows the ESs across all studies when exploring group differences in PA between individuals with FM and the respective control groups. In this review, the smallest reported ES was 0.45, between individuals with FM/OA, and those with OA only [23]. The largest ES was 1.08, between an FM and an OA sample [4]. Two studies reported small to medium ES [11,23], six studies reported medium to large ES [11,28,47,60,76,77] and four reported large ES [4,35,74,75].

[5] $SD = SE \times \sqrt{N}$

Table 2.

Quality Assessment.

Study	Representative Sample	Power calculation	Controlled for group bias?	Validated PA measure	Main or preliminary outcome	Appropriate statistical analysis	Evidence of bias
[4] Becerra-Garcia 2014	Yes	None reported	Partial	Yes	Main	Yes t-tests	Small sample size. No male participants. Examined if there were group differences in demographics but did not consider the possibility of other influencing extraneous variables e.g. pain.
[11] Davis 2001	Unclear	None reported	No	Yes	Main	Yes ANOVA	No male participants. Participants not excluded from FM group if they had OA too. Did not control for group differences in pain, general health, physical functioning or mental health.
[23] Finan 2009	Unclear	Yes	Partial	Yes	Preliminary	Unclear not stated	No male participants. Creation of a combined FM/OA group not justified. Does not specify f-statistic test used. Controlled for differences in pain and age, but not education (which predicted PA).
[27] Hamilton 2007	Yes	None reported	No	Yes	Preliminary	Yes t-test	Did not control for differences in age, length of illness, pain or sleep quality.
[28] Hassett 2008	Unclear	Yes	Yes	Yes	Main	Yes ANOVA	No male participants. Both groups drawn from larger sample of Lyme Disease study. Controlled for age, sex, education and marital status.

Table 2.

Quality Assessment.

Study	Representative Sample	Power calculation	Controlled for group bias?	Validated PA measure	Main or preliminary outcome	Appropriate statistical analysis	Evidence of bias
[35] Kratz 2007	Unclear	None reported	No	Yes	Preliminary	Unclear not stated	No male participants. Participants not excluded from FM group if they had OA too. Did not control for differences in average pain or pain catastrophising. Unclear if there were significant differences in age, length of illness, sleep quality and fatigue.
[47] Nicolson 2010	Unclear	None reported	No	Yes	Preliminary	Chi-square	No male participants. Participants not excluded from FM group if they had OA too. Did not control for differences in age, pain or depressive symptoms.
[60] van Middendorp 2008	Yes	None reported	Partial	Yes	Preliminary	Yes MANCOVA	Controlled group differences in education and marital status, but not medication history.
[74] Zautra 2007	Unclear	None reported	No	Yes	Preliminary	Unclear not stated	No male participants. Participants not excluded from FM group if they had OA. Does not specify f-statistic test used. Did not control for group differences in age, fatigue or depression. RA group completed paper diaries. FM and OA electronic diaries.

Table 2.

Quality Assessment.

Study	Representative Sample	Power calculation	Controlled for group bias?	Validated PA measure	Main or preliminary outcome	Appropriate statistical analysis	Evidence of bias
[75] Zautra 2005a	Unclear	None reported	Yes	Yes	Main	Yes MANOVA	No male participants. Participants in both groups could have other conditions as long as FM or OA was 'worst'. Controlled for differences in age and pain.
[77] Zautra 2005b	Unclear	None reported	No	Yes	Preliminary	Yes t-test	No male participants. Participants not excluded from FM group if they had OA too. Did not control for group differences in age, neuroticism, pain or interpersonal stress.
[76] Zautra 1999	Yes	None reported	Yes	Yes	Preliminary	Yes ANOVA	No male participants. Controlled for differences in age and pain.

Note. FM = fibromyalgia, OA = osteoarthritis, OA surgery = osteoarthritis patients awaiting knee surgery; RA = rheumatoid arthritis,

FM/OA = participants with a dual diagnosis of fibromyalgia and osteoarthritis; PA = positive affect.

2.5 Discussion

The aim of this present study was to systematically review the evidence that suggests individuals with FM demonstrate a deficit in PA. The key findings from 12 studies were extracted and appraised. In summary, 11 of the 12 studies found evidence of a deficit in PA, specific to the FM population. It can therefore be inferred with a degree of confidence that this is a consistently present phenomenon. The single study which failed to replicate this finding [27], had considerably smaller sample sizes than all but one of other studies which may have meant it was insufficiently powered to detect the presence of any statistically significant effects. Moreover, it was the only study to use the Mood Adjective Checklist [17] to measure PA, as opposed to the more widely used PANAS [68,69]. It is possible that the Mood Adjective Checklist does not measure the PA construct as well as the PANAS as it only uses 4-items to measure PA, and it has been suggested the items conflate PA/NA with the concept of pleasantness/unpleasantness [64].

Notably, the findings showed evidence of a deficit in PA in individuals suffering from FM which was consistent in relation to a range of comparison populations. The most commonly used comparison group was individuals with OA [11,23,35,47,74-77]. This makes sense as OA is also a long term pain condition, characterised by pain flare ups. That individuals with FM consistently report lower PA than those with OA, and also RA [74], is further evidence that the deficit is specific to the FM population, as opposed to chronic pain conditions more widely. Moreover, Hassett and colleagues [28] purposely used a control group made up of individuals with a whole range of physical health conditions in an attempt to match the groups with regards to levels of pain, fatigue, the effect of having long term symptoms and the need to frequently seek health care. This review also suggests the deficit is apparent when comparing individuals with FM to the general population [4,60].

A final key finding of this review is that it extended the existing data by calculating and reporting ESs relating to the magnitude of group differences in PA. It is important to go beyond examining for statistical significance and to consider the clinical significance of significant effects.

This additional analysis revealed that the majority of group differences produced medium-to-large ESs.

Clinical Implications

It is necessary to consider the findings of this review within the context of their potential clinical relevance. The many potential health benefits of increased positive affect, and related concepts such as well-being, were outlined in the introduction to this paper. In general, people who report an increase in positive emotions and well-being live longer and are also less likely to develop a range of health conditions [15,16]. In a comprehensive review synthesising cross-sectional, experimental and longitudinal data, Lyubomirsky and colleagues reported that increased well-being and PA "*preceded success*" in that happier people were more likely to gain employment and have higher job satisfaction, enjoy meaningful social support and higher relationship satisfaction, report fewer physical health problems and cope better with distress [39]. When focusing in on the FM population in particular, individuals with FM who report higher PA tend to experience pain less frequently [77] as well as exhibit a higher tolerance for pain when it is present [21,61], experience less NA, be less likely to have co-morbid psychiatric difficulties [28] and also report better general physical functioning [61]. Thus, finding that individuals with FM consistently report lower levels of PA than other pain and physical health population as well as healthy controls, and that the size of this deficit is considerable in magnitude is of clear importance.

As with any research, this review must be considered within the context of its potential limitations. The limitations of the studies included in the review shall be addressed first, followed by the limitations of the review itself.

Limitations of Study Quality

First, as can be seen in Table 2, the degree to which the FM samples were truly representative of the FM population as a whole is not clear, as the samples were potentially confounded by a number of factors. Seven studies compared individuals with FM to those with OA; however, four of these

studies included individuals with a dual diagnosis of FM and OA within the FM sample, as long as individuals reported that FM caused them most difficulty [11,35,74,77]. In contrast, one study [23] created a completely separate group of individuals with both FM and OA and then compared them to FM only and OA only samples. None of these studies included rationales to justify their design and methodology. This may impact on the degree to which it can be confidently inferred that deficits in PA are specific to individuals with FM compared to the wider pain population as whilst the dual diagnosis FM/OA group reported significantly lower PA than the OA only group, the FM only group did not. It may be the accumulation of chronic pain disorders, rather than FM specifically that has an impact on PA. However, if this were true, it would be expected that the FM/OA group also reported significantly lower PA than the FM only group, which they did not.

Moreover, Hassett *et al*. [28] took their sample from a larger trial of individuals with Lyme Disease (LD). The FM group were individuals who had recovered from LD and met the criteria for FM. The control group of individuals who met criteria for a range of physical health conditions was also drawn from the larger sample of the LD study. So, whilst the bias of having had LD was consistent across groups, the FM sample may have differed from the FM population 'norm' due to experiencing a recent episode of LD. Similarly, Zautra and colleagues [75] reported that the presence of other health conditions did not preclude individuals from being included in their FM sample, but provided no data on the types or frequency of such conditions to assess whether this biased the sample in any way. Furthermore, only 1.5% of the total FM sample across all studies were male. Although FM predominantly affects women, the figures from FM prevalence studies [46] suggest that male FM sufferers are considerably under-represented in this review.

Second, only three studies reported having performed a power calculation to ascertain the necessary sample sizes to ensure adequately powered studies. Whilst some were clearly likely to have sufficient numbers for the analysis [e.g. 28], others were probably underpowered [e.g. 27]. Moreover, a number of studies used considerably unequal sample sizes which may also affect the results [e.g. 11,35].

Third, there were several issues relating to the analyses used. Three of the ten studies [23,35,74] failed to report what analysis they used to compare the groups when assessing for PA deficits. Moreover, a number of studies failed to control for other study variables that differed between samples, such as reported levels of pain. Six studies did not report controlling for any study variables which may have confounded group differences in PA, and a further three controlled for some, but not all potential confounding variables. Table 2 provides further details on the potentially confounding variables. These limitations may be linked to the fact that exploring group differences in PA was not the main outcome in the majority of studies, but rather a preliminary stage before a more thorough analysis relating to the studies main aims.

Fourth, all of the studies used validated measures of PA, with 11 of the 12 using the PANAS or PANAS-X. This has both advantages and disadvantages. The common assessment method made it easier to compare and summarise the findings of the studies both within the context of this review and also the wider literature base where the PANAS appears to be the dominant method of assessing PA. Furthermore, it strengthens the confidence with which it can be said that individuals with FM consistently report lower PA compared to a range of different control groups assessed in the different studies, as they have all been assessed in the same way meaning there is no between-study measurement variance. However, reliance on a single measure can leave results open to flaws and biases of that measure. This potential limitation is considered unlikely though, as the PANAS is a well-validated, theoretically-derived measure. It is important to note that the only study not to report a significant deficit in PA within an FM sample [27] used a different measure, the Mood Adjective Checklist. This could reflect the methodological limitations of the study, such as small sample sizes and failing to control for potentially confounding variables. Alternatively, the difference in findings may reflect that either the PANAS or Mood Adjective Checklist does not measure PA well or that they measure PA based on different constructs.

Finally, a potential limitation of this studies included in this review, is that eight of the 12 studies were reported by the same research group [11,35,47,74-77]. Though not explicitly stated, there

is a possibility that the samples reported within these studies could overlap to some extent. This would mean that the total sample in this review is not only smaller than reported, but that some of the results could be in part a repetition of the same finding, which could greatly bias the overall review findings. Whilst this is a conservative speculation, similarities in recruitment methods and geographical location mean that it is important to consider.

Review Limitations

Limitations of the review process must also be acknowledged. The search strategy and applied exclusion criteria used may have resulted in the omission of relevant evidence. The practical decision was made not to include non-English language papers. This largely limits the generalizability of the findings to individuals from white, western cultures. In addition to this, only published findings were included which potentially leaves the review open to the so-called 'file drawer' bias. Studies that find significant results tend to be more readily publishable than those that do not, potentially inflating the size of the reported significant results.

The review also chose to focus solely on identifying a deficit in PA within the FM population, to the exclusion of looking at NA. This decision was made based on the combination of a number of factors. Firstly, the evidence base points to the relative independence of NA and PA, which would imply that they are likely to make unique contributions to outcomes in the FM population. This has been supported by findings that within FM, NA and PA load on to separate factors (referred to "vulnerabilities" and "resources" by researchers) that independently predict different outcomes [61]. Secondly, the research tradition for focusing on the presence of distress is well-documented, whereas the investigating presence of positive psychosocial resources and their implications remains less clear. Lastly, the Dynamic Affect Model [73,78] may suggest that the proposed changes in the relationship between NA and PA are best conceptualised as a relative drop in PA as opposed to an increase in NA. This is supported by the fact that, whilst 12 studies in this review also reported group differences in

NA, only 5 studies found individuals with FM reported significantly higher levels of NA than the other study populations [4,60,74,76].

Future Research

This review points towards three key paths of future research. The first is the need for well controlled, high quality studies to better assess the true presence and magnitude of deficits in PA specific to the FM population. The majority of studies reported here investigated group differences in PA as a preliminary analytical step prior to main analyses of the studies respective aims and hypotheses. As a result, methodological rigour was somewhat lacking, or at best, not reported for the sake of brevity. Future research should be designed specifically for the purpose of investigating group differences in PA, with stringent methodology regarding inclusion and exclusion criteria for FM and comparison groups as well as appropriate analytical methods to minimise biases. Furthermore the inclusion of samples that include more men with FM, and that better represent non-western cultures, would strengthen the research base.

Next, future research would benefit from an investigation of the mechanisms through which higher PA leads to better outcomes. Several studies reviewed here indicate that PA may be an important predictor of the common symptoms of FM including pain, fatigue, physical functioning and negative affectivity [28,61,74,75,77]. What is less clear is the path through which PA may affect these symptom variables. One study [77] did specifically tested whether a long-term disposition towards levels of PA are predictive of better outcomes, as specified by the Broaden-and-Build hypothesis [24], or whether the ability to specifically maintain higher levels of PA during critical periods (e.g. pain flare ups) is more predictive of better outcomes as per the Dynamic Affect model [73,78]. However the findings have failed to conclusively support one theory over the other. Further investigation on why and how increased levels of PA are more beneficial to individuals with FM should be undertaken.

Another direction for future research is to explore how clinical interventions may be used to increase PA, and thus improve service users' well-being. There are already studies that suggest mindfulness-based interventions may be effective in increasing levels of PA for people with chronic pain [79]. This is supported by the findings of Kratz *et al.* [35] that increases in pain acceptance directly predicts higher levels of PA, and mediates the relationship between pain and NA, possibly through its influence on PA. Mindfulness promotes adopting *"a particular orientation toward one's experiences in the present moment, an orientation that is characterized by curiosity, openness, and acceptance*" [5].

Further exploration of how the two concepts are related, and if practice in mindfulness can bring about changes in PA should be investigated. Additionally, as the theory behind the benefits of PA arise from positive psychology, it is logical that this area may lead to the development of effective interventions as well. A recent meta-analysis of positive psychology interventions (PPIs) indicated that PPIs were an effective way of enhancing individuals' subjective well-being, and also reducing depression. Subjective well-being can be defined as "*a person's cognitive and affective evaluations of his or her life*" [19], and therefore PA is a major part of this construct. Indeed, the traditional method of measuring subjective well-being has been to create a composite score by using the PANAS to measure affective evaluation of one's life, and the Satisfaction with Life Scale [18] to measure the cognitive evaluation. Hope has long been established to be a major predictor of subjective well-being [53,54]. Thus, PPIs that specifically aim to promote hope may be particularly successful in cultivating PA.

What is more, in the UK, there is a particular drive within healthcare to promote the self-management of long-term conditions such as FM [13]. A key part of this policy is the Expert Patient Program [12], based on Lorig and colleagues' Chronic Disease Management Programme [37,38]. The Expert Patient Programme specifically emphasises goal setting and positive thinking which is compatible with a PPI approach. Studies that examine the way in which traits such as mindfulness and

hope relate to PA, as well as closely related constructs such as subjective well-being, would be a useful preliminary step in the development of interventions that aim to increase PA.

Conclusion

In conclusion, the results of this review have clearly demonstrated that individuals with FM consistently report a deficit in PA, a psychological resource well-known to be associated with a range of health benefits as well as wider positive outcomes related to social relationships and work. It is clear then, that when treating people with FM, assessing an individual's general levels of happiness and well-being should be part of routine clinical work. Moreover, interventions that focus on how to increase PA and well-being may be an effective alternative or complimentary approach to traditional symptom management for those individuals with FM reporting low PA. To aid this process, future research should in part focus on developing a better understanding of the mechanisms through which increased PA brings about health benefits for individuals with FM. Furthermore, resources should be invested in the design and trials of theoretically-driven interventions that aim to increase PA and well-being.

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Chapter 3:

Hope and Mindfulness Contribute to Subjective Well-Being in Individuals with Fibromyalgia[6]

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3.1 Abstract

Subjective well-being (SWB) is associated with a range of beneficial outcomes in those with physical health conditions. Yet the promotion of well-being is consistently neglected within healthcare settings in favour of the traditional focus on symptom reduction. Fibromyalgia (FM) is a chronic pain condition for which conventional treatment approaches have had limited success regarding consistent symptom management. The present study aimed to investigate whether: (i) goal-focused hope and mindfulness contributed to the promotion of SWB in the FM population, and (ii) whether higher SWB predicted improved FM-related outcomes. A total of 936 individuals with FM completed an online questionnaire study. Structural equation modelling tested the validity of a pre-specified hypothetical model of the relationships amongst study variables. SWB was found to significantly predict better FM-related outcomes and accounted for a substantial proportion of the total variance in this outcome. A model whereby mindful acceptance and hope both significantly predicted SWB, with decentering as a partial mediator to these relationships, was found to be an adequate fit, but results suggested that the model could be improved. These results indicate that SWB plays a key role in the experience of FM symptoms and therefore efforts to improve SWB should be a part of routine clinical practice alongside established symptom reduction approaches. Interventions that aim to promote SWB via enhancing mindfulness and hope maybe successful in this pursuit, but further research is needed to clarify the mechanisms through which these traits lead to better SWB.

3.2 Introduction

Fibromyalgia (FM) is a chronic pain syndrome of unknown pathology [45]; for which no single drug regimen nor psychological intervention is of consistent benefit [1,38,42]. Recently, there is growing interest in the contribution of positive psychological traits to health outcomes [41]. Well-being is more than just the absence of distress, as a lack of psychological distress does not guarantee the presence of well-being [26]. Research has indicated the presence of separate neural pathways within the brain for well- and ill-being [12,40]. Subjective well-being (SWB) is *"a person's cognitive and affective evaluations of his or her life"* [16]. The evidence suggests that individuals who have higher SWB enjoy a range of beneficial health outcomes including increased longevity and immunity [13,14]. As such, it is clinically relevant to investigate which intrapersonal factors contribute to SWB specifically within the FM population, where effective treatments are somewhat limited.

Both goal-focused hope [36,39] and mindfulness [6,7,33] have been identified as contributors to SWB. Goal-focused hope consists of having the motivation and self-belief in one's ability to plan how to achieve desired goals [36]. Mindfulness has been conceptualised as a process involving the capacity to sustain present moment awareness and acceptance and curiosity to one's internal experiences [5]. Evidence suggests that Mindfulness-based interventions are an efficacious treatment for chronic pain, including FM [22,48].

It has been proposed that mindfulness leads to improvements in well-being via increased decentering [21,34,35], which is a fundamental metacognitive shift in the ability to recognise one's thoughts as thoughts, rather than necessarily true facts [21] (appendix A). Decentering may increase SWB by reducing depressive rumination [21,34], increasing openness to new experiences, and also by increasing awareness of the positive aspects of experiences that would have previously been interpreted as neutral [20]. The broaden-and-build hypothesis [19] suggests that in turn, higher SWB may be beneficial to those with FM in that experiencing times of well-being may expand an

individual's "*thought-action repertoire*", allowing for the accrual of a range of coping resources that can then be used in times of distress.

As mindfulness is present-focused and non-judgemental, and goal-focused hope is future-orientated and striving, intuitively the two concepts appear conflicting. Yet both contribute to SWB and, moreover, preliminary data suggests that they may in fact be strongly correlated (Marks, unpublished dissertation[7]). Given this, and the fact that decentering is proposed to be the mechanism of change in interventions other than mindfulness alone [21], it would be of interest to investigate how hope and decentering relate to each other. Therefore, the aim of this study is to investigate if goal-focused hope and mindfulness predict SWB in the FM population, and if decentering mediates these relationships.

Hypotheses

1. Increased mindfulness will predict increased SWB; this will be mediated by increased decentering.
2. Increased hope will predict increased SWB; this will be mediated by increased decentering.
3. Increased SWB will predict fewer FM-related difficulties.

3.3 Method

Participants

Participants were a sample of individuals with fibromyalgia living in the community. The inclusion criteria were: (i) a self-reported clinician-confirmed diagnosis of FM, (ii) being aged 18 years or older, and (iii) being a resident of the UK. In total, 1171 individuals consented to take part in the study. Only those who completed all of the measures were included in the analysis, leaving 960 participants. Of these, 24 of the respondents reported that they did not have a diagnosis of FM as

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confirmed by a medical professional. As such, they were excluded from the analysis. Therefore the final sample size was 936.

The sample consisted of 873 women and 63 men. The mean age was 47.97 years old (SD 10.82, range 19 – 82). In total, 80% (n = 753) of the sample were taking medication to manage their FM symptoms, and 28% (n = 260) had previously completed some form of mindfulness-based intervention. When asked about meditative practice, 66% (n = 621) of participants reported that they did not practice any kind of meditation, 15% (n = 144) of the sample had practiced meditation for less than a year, 9% (n = 81) had practised for one to five years, and 10% (n = 90) for five years or more.

Measures

Hope was assessed using the State Hope Scale [appendix B, 37]. Factor analysis supports a six-item measure which consists of three items measuring 'pathway': the ability to plan and perceive how one can attain one's goals. An example item being: "If I should find myself in a jam, I could think of many ways to get out of it". The remaining three items measure 'agency': the motivation and ability to pursue pathways to one's goals. An example agency item is: "At the present time, I am energetically pursuing my goals". Each item is Likert-rated from 1 (definitely false) to 8 (definitely true). The Cronbach's alpha for the pathway and agency subscales in this sample were $\alpha = .82$ and $\alpha = .89$ respectively.

Mindfulness was measured using the Philadelphia Mindfulness Scale [PHLMS; appendix C, 10]. The scale was devised to measure mindfulness based on the operational definition devised by Bishop and colleagues [5]. Confirmatory factor analysis supported a 20-item structure measure consisting of two orthogonal subscales: awareness and acceptance. Each item is Likert-rated from 1 (never) to 5 (very often). An example awareness item is: "I am aware of what thoughts are passing through my mind", and an example acceptance item is: "I try to distract myself when I feel unpleasant emotions". The Cronbach's alpha in the present study was $\alpha = .79$ for the awareness subscale and $\alpha = .85$ for the acceptance subscale.

Decentering was measured using the decentering subscale of the Experiences Questionnaire [EQ; appendix D, 21]. It consists of 11 items measured on a 5-point Likert scale ranging from 1 (never) to 5 (all of the time). An example item is: "I can observe unpleasant feelings without being drawn into them". In its development, the EQ demonstrated good convergent and divergent validity. It was positively correlated with cognitive reappraisal, and negatively correlated with depressive rumination, experiential avoidance and emotional suppression. Within the present sample, the Cronbach's alpha was $\alpha = .87$.

As previously discussed, SWB refers to a person's cognitive and affective evaluation of their life. Consistent with previous research [e.g. 16], the latent variable SWB was estimated through measuring life satisfaction as a cognitive evaluation of life, as well as exploring participants' affectual experiences.

Life satisfaction was measured using the Satisfaction with Life Scale [SWL; appendix E, 15]. It is a five-item measure of life satisfaction where each item is rated on a Likert scale from 1 (strongly disagree) to 7 (strongly agree). An example item is: "So far I have gotten the important things I want in life". The measure was shown to correlate well with existing measures of SWB. In the present study, the Cronbach's alpha was $\alpha = .87$.

Positive and negative affect was measured with the Positive and Negative Affect Scale [PANAS; appendix F, 43], which is a 20-item questionnaire consisting of two 10-item subscales that measure positive affect (PA) and negative affect (NA). The authors reported that a principal factor analysis supported the measurement of PA and NA as two independent factors. Affect is measured by asking participants to rate the extent to which they have experienced a range of mood states during the past week on a Likert scale from 1 (very slightly) to 5 (extremely). Examples of PA mood states include "enthusiastic" and "inspired", whereas, examples of NA mood states include "afraid" and "irritable". Cronbach's alpha of PA and NA within this sample were both $\alpha = .91$.

Finally the extent of *FM-related difficulties* and their impact were measured using the Revised Fibromyalgia Impact Questionnaire [FIQR; appendix G, 4]. The FIQR is a 21-item measure

comprised of three domains. Nine items measure functional status, for example: “fibromyalgia made it difficult to [brush or comb your hair]”, two items measure overall impact of FM, for example: “Fibromyalgia prevented me from accomplishing goals for the week”, and 10 items measure the presence of common FM symptoms, for example: “Please rate your level of [pain]”. Participants are asked to think about how FM has impacted on their life over the last seven days. For each domain, items are rated on an 11-point Likert scale ranging from 0 to 10, with higher scores indicating that their FM has had a greater impact on their life. The FIQR has demonstrated good discriminant validity in identifying those with FM from healthy controls, individuals with rheumatoid arthritis and individuals with lupus. In this present study, Cronbach’s alpha for the functional, overall impact, and symptom domains were $\alpha = .93$, $\alpha = .87$ and $\alpha = .88$, respectively.

Procedure

This was a cross-sectional internet-based study. Institutional and ethical approval was obtained from the University of Liverpool (see appendix H). The study was then advertised through two national fibromyalgia charities, who placed a brief description of the study and a link on their forums and social media pages. The link took participants to web page containing the participant information sheet, which described the aims and nature of the study in detail, and a consent form (appendix I and J respectively). Participants were informed that they could withdraw at any point during the study by closing the internet browser, or otherwise leaving the study page. It was made clear that incomplete responses would be deleted and not included in the final data set.

Questions about demographic information and previous mindfulness-based interventions preceded the start of the questionnaires. Each measure was then presented on a separate page in the following order: SLW, PANAS, PHLMS, EQ, Hope Scale, FIQR. The FIQR was deliberately placed at the end as it was hypothesised that focusing participants’ attention on symptoms such as pain, fatigue and depression may have potentially negatively primed their mood. In total, participating in the study took approximately 15 minutes. A purposeful effort was made to keep participation time to a

minimum as FM symptoms can make it difficult for sufferers to sit in one place and concentrate for long periods of time.

Analysis

SPSS 21 was used to manage the data and for the preliminary analyses. This included exploring whether the data met the necessary assumptions for structural equation modelling (SEM), as well as analysing first-order correlations amongst study variables.

SEM was then employed to test the studies main hypotheses using AMOS 20 [2]. The first stage of SEM is to construct a hypothesised model of the relationship amongst the variables of interest, *a priori*. SEM then works by estimating a covariance matrix based on the specified model. Next this estimated covariance matrix is compared to the covariance matrix generated from the observed data, to consider how well they "fit". Model fit was determined via the chi-square statistic (χ^2) which should be non-significant ($p > .05$). However the χ^2 can be biased towards rejecting models in large sample sizes [9], hence the need to report it within the context of other fit indices. As per Hu & Bentler's [25] recommendations, how well the hypothesised model fit the observed data was assessed using the following goodness of fit indices and cut offs: the Comparative fit index (CFI) > .95; the Root Mean Square-Error of Approximation (RMSEA) $\leq .06$; and the Standardised Root Mean Square Residual (SRMR) $\leq .08$. See appendix K for a more detailed explanation of SEM analysis and fit indices.

Consensus is lacking with regards to what is an acceptable sample size for SEM approaches. One proposed recommendation is that a minimum sample size of 200 is necessary [27]. Alternatively, another suggestion is that a minimum sample size should represent at least 10 participants per estimated parameter [32]. This paper will go onto present two SEM models. The first included 17 parameters (eight regression weights, six error variances, three covariances) indicating a minimum sample size of 170. The second model consisted of 22 parameters (12 regression weights, six error variances, four covariances) indicating a minimum sample of 220. As the total sample size in this study is 936, it can be assumed that the analysis was adequately powered.

3.4 Results

Data Screening

The online questionnaire design did not allow participants to miss out questions and any incomplete responses were treated as withdrawals in line with the study's protocol. Therefore there were no missing data. Initial data screening explored the normality and heteroscedasticity of the study variables. Normality was explored using histograms, which suggested that SLW (sk = .66[8]), PA (sk = .47), both the pathway (ku = -.92) and agency (sk = .46) subscales of the hope scale, and all three subscales of the FIQR (function sk = -.71, overall impact sk = -.79, symptoms sk = -.60) were not normally distributed. Following log transformations, SWL and PA were normally distributed, however it was not possible to successfully transform the subscales of the hope scale or FIQR. Instead total scale scores were computed for these measures. The Total FIQR score appeared normally distributed and a log transformation of the total hope score resulted in a normally distributed variable.

Heteroscedasticity occurs where the residuals are not uniformly distributed. Heteroscedasticity between variables can be a problem in SEM as it can undermine the assumption of multivariate normality [27]. The distribution of residuals were explored through a series of multiple regression analyses within which each of the endogenous variables (decentering, SLWS, PA, NA and FIQR) were entered as the dependent variable, and all the other model variables entered as predictor variables. The histograms of the regression residuals suggested normality. Some of the resulting scatterplots of predicted values versus residuals indicated that there was potentially a mild degree of heteroscedasticity amongst some of the variables. Given that the amount of heteroscedasticity was limited, and the sample size was very large, it was unlikely that this would contravene the assumptions of SEM [28]. For further information regarding data screening, see appendix L.

[8] Figures in brackets report non-normal skewness (sk) and kurtosis (ku) statistics.

Descriptive Statistics

Mean descriptive statistics for the key study variables are reported in Table 3.1. Male and female participants did not significantly differ on any of these variables (all *p*'s > .05). Individuals who were taking medication reported significantly higher levels of NA, t (934) = 3.47, $p < .01$, and FM-related difficulties, t (934) = 6.27, $p = .04$. Cohen's *d* was used to examine the effect size (ES) of these differences. The ES was small for the group difference in NA ($d = .23$) and small-to-medium for FM-related difficulties ($d = .41$). There was no difference between participants who were taking medication and those who were not for the remaining study variables (all *p*'s > .05). To see how the means reported for this sample compare to existing normative means, please see appendix M.

Table 3.1.

Descriptive Statistics.

Variable	Mean	Standard Deviation	Range
SWL	14.66	7.05	5 – 35
(SWL [a])	(1.11)	(0.22)	(0.70 – 1.54)
PA	23.35	8.45	10 – 48
(PA [a])	(1.34)	(0.16)	(1.00 – 1.68)
NA	26.31	9.35	10 – 50
Hope	23.43	10.68	6 – 48
(Hope [a])	(1.32)	(0.22)	(0.78 – 1.68)
M'ful aware	36.48	5.94	13 – 50
M'ful accept	25.31	6.60	10 – 50
Decentering	33.02	6.96	14 – 55
FM	68.54	18.52	5 – 100

[a] *denotes transformed variable. The numbers in brackets represent transformed values.*

Note. SWL = satisfaction with life; PA = positive affect; NA = negative affect, M'ful aware = mindful awareness; M'ful accept = mindful acceptance; FM = fibromyalgia-related difficulties.

Correlations

Pearson's correlations were calculated for all pairs of variables and are reported in Table 3.2. Hope and mindful acceptance were significantly correlated with all of the SWB variables as predicted. However, mindful awareness was only significantly correlated with PA. Hope, mindful acceptance and mindful awareness were each positively correlated with decentering. In turn decentering was significantly correlated with all of the SWB variables as predicted. All of the study variables, except for mindful awareness, were significantly correlated with the impact of FM-related difficulties.

Mindful attention and mindful acceptance were significantly negatively correlated. This is somewhat in line with past research [3] and will be addressed further in the discussion section. Unexpectedly, neither mindful attention nor mindful acceptance were significantly related to having previously received a mindfulness-based intervention (r = .06, p = .05 and r = .02, p = .56 respectively), and only mindful awareness was significantly correlated to practicing meditation (r = .16, $p < .01$).

Age was significantly associated with higher levels of PA, decentering and mindful acceptance, as well as lower levels of NA, though the correlations were relatively weak. Lastly, duration of FM symptoms was significantly associated with higher levels of PA, decentering and mindful awareness, lower levels of SWL, and increased FM-related difficulties. Again, all of these correlations were relatively weak.

Table 3.2.

Correlation Matrix of All Study Variables.

Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1. SWL [a]										
2. PA [a]	**.45****									
3. NA	**-.46****	**-.39****								
4. Hope [a]	**.55****	**.65****	**-.53****							
5. M'ful aware	.03	**.22****	-.01	**.18****						
6. M'ful accept	**.30****	**.24****	**-.53****	**.32****	**-.23****					
7. Decentering	**.34****	**.52****	**-.47****	**.60****	**.42****	**.26****				
8. FM	**-.49****	**-.49****	**.55****	**-.57****	-.06	**-.36****	**-.36****			
9. Age	-.02	**.08***	**-.14****	.06	**.06**	**.08***	**.15****	<.01		
10. Duration	**-.10****	**.07***	-.04	.02	**.14****	-.02	**.09****	**.12****	**.21****	

** Significant at .05 level, two-tailed.*

*** Significant at .01 level.*

[a] *denotes transformed variable. For these variables the correlations reported reflect the relationship between the transformed variable and the other study variables.*

Note. SWL = satisfaction with life; PA = positive affect; NA = negative affect, M'ful aware = mindful awareness; M'ful accept = mindful acceptance; FM = fibromyalgia-related difficulties; Duration = duration since FM symptoms began.

SEM Analysis

SEM was used to test a hypothesised model where decentering mediated the relationship between the mindfulness variables and SWB, as well as mediating the relationship between goal-focused hope and SWB. The model also specified that increased SWB would result in fewer FM-related difficulties. The Maximum Likelihood method was used to estimate the parameters of the proposed model based upon the data covariance matrix, $\chi^2 = 798.62$, $p < .01$, CFI = .74, RMSEA = .22, SRMR = .15. The χ^2 was significant, indicating that the hypothesised model did not fit the exact data. This was expected due to the large sample size. However, further examination of the fit indices suggested that the model was indeed a poor fit (see section 3.3). The model complete with standardised and unstandardised regression weights, associated significance values, and R^2 values are reported in figure 3.1.

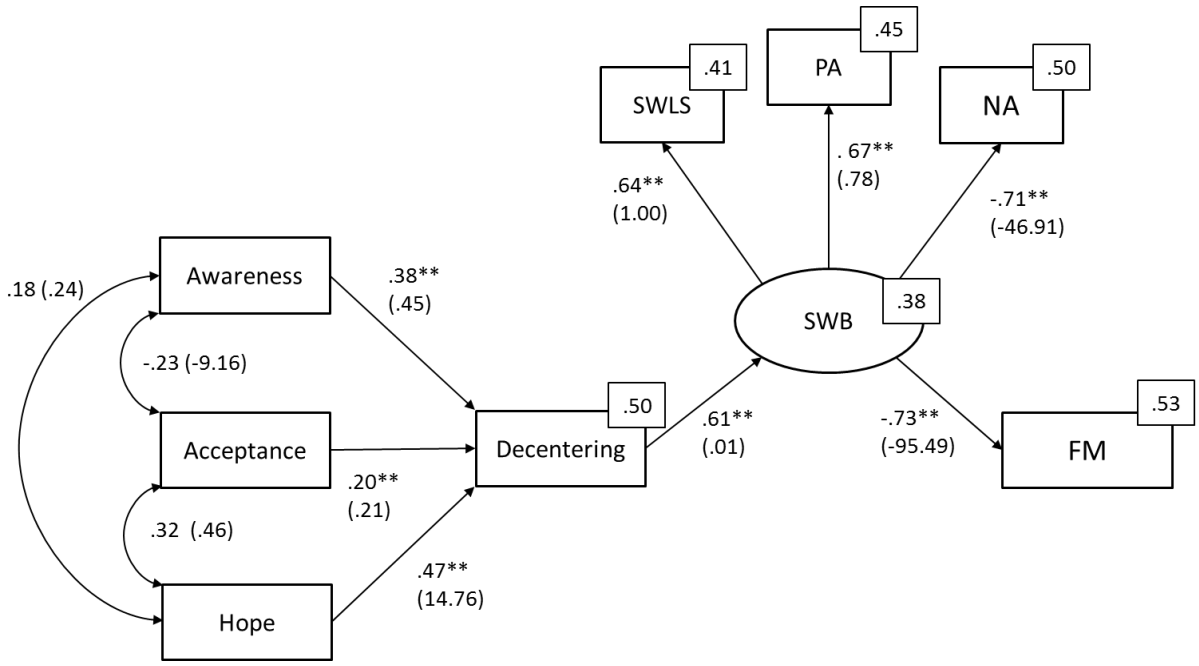

Figure 3.1. Graphical Representation of the Initial Proposed Model.

Standardised regression slopes are depicted by single-headed arrows and covariance by curved double-headed arrows. The unstandardised regression weights are reported in the brackets. The total standardised proportion of variance accounted for (R^2) is reported to the top right hand corner for each endogenous variable.

*** Significant at .001 level.*

Model Modification

As the model was a poor fit, the modification indices were examined to ascertain how it could be improved, though it was important that any modifications were theory-driven [9]. The modification indices suggested adding direct paths from mindful awareness, mindful acceptance and hope to SWB would significantly improve the model fit.

The initial model proposed that decentering fully mediated the relationships between hope and SWB, and mindfulness and SWB respectively. The addition of indirect paths represented a

change from a full to a partial mediation model where each of the three predictor variables each contributes something unique to SWB directly as well. This seemed a reasonable modification to make as it did not drastically alter the original hypothesis regarding mediation. Similarly, the modification indices suggested an additional direct regression slope between decentering and FM symptomology would improve the model, again implying that the relationship is partially mediated by SWB, but that decentering contributes something unique to FM symptomology directly. The modified model estimated both the direct and indirect effects predictor variables had on dependent variables. Bootstrapping was used to generate confidence intervals to test whether the indirect effects were significantly different from zero [31]. In the current study, 5000 bootstrap iterations were conducted [18]. Finally, the residuals associated with NA and PA were allowed to covary in the model. This reflects a common measurement relationship in that PA and NA were both measured in the same way using the PANAS (unlike SWL).

The modified model was also estimated using the ML approach, $\chi^2 = 152.34$, $p < .01$, CFI = .95, RMSEA = .11, SRMR = .05. Again the χ^2 was significant indicating that the model was significantly different from the 'perfect' model, though again this may partly reflect the sample size. The CFI and SRMR indices indicated that the new model was a good fit. However, the RMSEA exceeded the cut-off of .06. The modified model was a significantly better fit than the original model ($\Delta\chi^2 = 646.28$, df = 5, $p < .01$). Interpreting the fit statistics together suggests that the model is an acceptable fit, but that there may be room for improvement. Further modifying the model at this stage, however, would be going beyond a clear theoretical rationale, and may result in over-fitting to the data set, limiting its generalisability. Figure 3.2 depicts the modified model with standardised and unstandardised direct effects, associated significance values, and R^2 values.

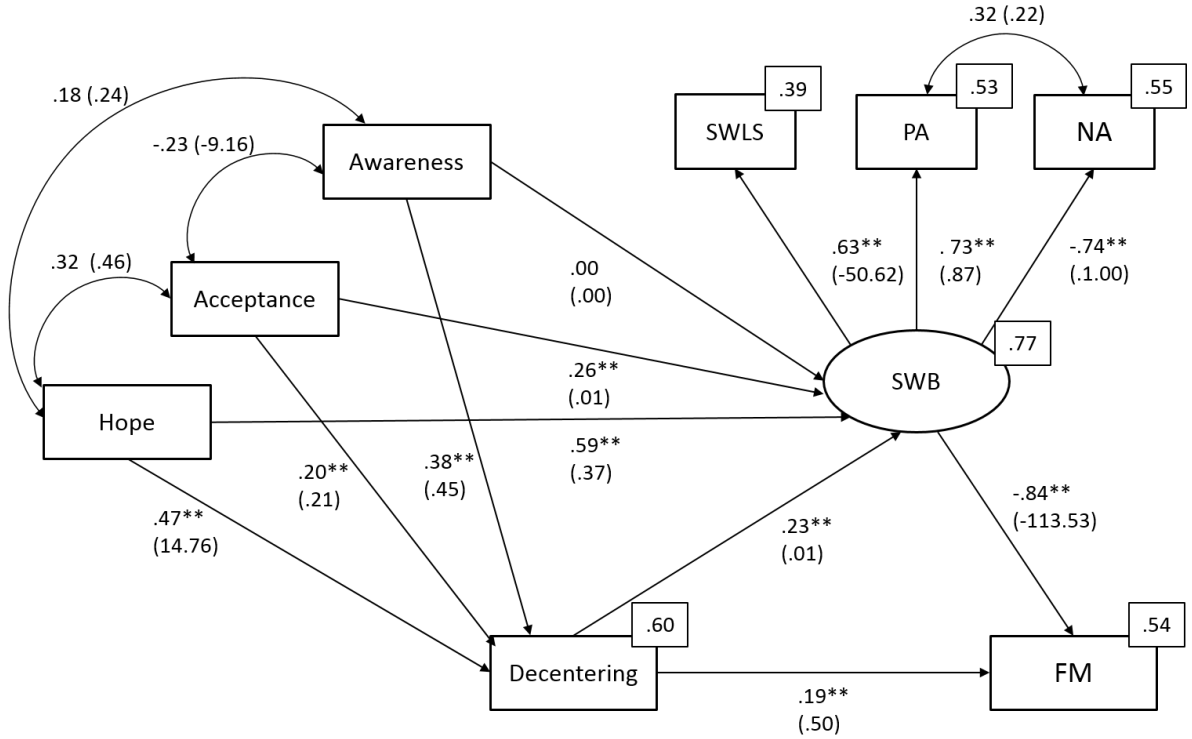

Figure 3.2. Graphical Representation of the Modified Model.

Standardised regression slopes for direct effects are depicted by single-headed arrows and covariance by curved double-headed arrows. The unstandardised regression weights are reported in the brackets. The total standardised proportion of variance accounted for (r^2) is reported to the top right hand corner for each endogenous variable.

*** Significant at .001 level.*

The standardised indirect effects are reported in Table 3.3. In the modified model, all indirect effects were significantly different from zero, except for the indirect relationship between mindful awareness and SWB. As suggested by McDonald and Ho [30], a matrix of observed covariances and residual covariances are reported in Appendix N.

Table 3.3.

Standardised Indirect Effects for the Modified Model.

Predictor	**Outcome**	**Indirect Effect**	**Lower CI**	**Upper CI**
M'ful aware	SWB	.09**	.06	.12
M'ful aware	FM	<.01	-.05	.04
M'ful accept	SWB	.05**	.03	.06
M'ful accept	FM	-.22**	-.27	-.18
Hope	SWB	.11**	.08	.14
Hope	FM	-..50**	-.54	-.46
Decentring	FM	-.20**	-.25	-.14

*** Significant at .01 level, two-tailed.*

Note. M'ful aware = mindful awareness; M'ful accept = mindful acceptance; SWB = subjective well-being, FM = fibromyalgia-related difficulties, Lower CI = lower confidence interval, Upper CI = upper confidence interval.

3.5 Discussion

This study had three main aims: (i) to investigate if mindfulness predicted SWB, and whether this relationship was mediated by decentering; (ii) to investigate if hope predicted SWB, and whether this relationship was mediated by decentering; and (iii) to explore the importance of SWB on FM-related symptoms. Both mindful acceptance and hope significantly predicted SWB, and that both of these relationships were partially mediated by decentering. In contrast, mindful awareness did not have any significant direct effect on SWB, nor did it have an indirect effect through decentering. Furthermore, the SEM model showed that SWB accounted for a significant amount of variance in FM-related difficulties, indicating that participants who had higher SWB reported fewer FM-related difficulties.

That mindful acceptance significantly predicted SWB whereas mindful awareness did not, fits with past research. In developing the PHLMS, Cardaciotto and colleagues [10] found that the acceptance subscale was negatively associated with measures of depression and anxiety, whereas the awareness subscale was not. They concluded that the acceptance component of mindfulness may play a unique role in relation to mental health. The current study suggests that mindful acceptance may also have a distinct role in the promotion of well-being. Moreover, as in this study, Baer and colleagues also found that the "observe" and "accept without judgement" subscales of their mindfulness scale were negatively correlated [3]. They suggested for less experienced meditators, developing skills in present moment awareness of experiences may be associated with the tendency to be judgemental of these experiences, implying that acceptance may develop after or slower than awareness skills. Therefore, in individuals with chronic pain who have increased awareness of experiences related to pain without yet cultivating an accepting attitude, this increased awareness would not lead to increased SWB.

It is an interesting finding that despite seemingly representing different ideologies, both goal-focused hope and mindful acceptance predicted SWB, and the relationships were mediated by

decentering. Moreover hope was positively correlated with both mindfulness subscales. One possible explanation is that mindfulness and hope correlate because they map onto an underlying construct of Psychological Flexibility, which has been defined as the ability to be aware fully in contact with the present moment, and to persist in or change behaviour when doing so serves ones values [23,24]. Psychological flexibility is theorised as consisting of two broader over-arching factors. The first is mindfulness and accepting processes which includes: (i) cognitive defusion, the ability to recognise thoughts as thoughts and not immutable facts; and (ii) acceptance of distressing experiences as oppose to avoidance. The second factor is committed behaviour processes. This includes values that are freely chosen qualities that an individual considers important to how they wish to live their lives; and also the persistence with committed action that is consistent with living within ones values. It is often conceptualised as goal-driven, in that an individual will have behaviour goals that they can achieve, that allow them to act within their values.

It is possible to see how the model presented in this study can be reconciled with the above definition of psychological flexibility. Mindful acceptance and decentering may be akin to the defusion and acceptance processes. Goal-focused hope maybe be akin to committed action process (e.g. “At this time, I am meeting the goals that I have set for myself”), as well as values (e.g. “Right now, I see myself as being pretty successful”). Mindful awareness as measured in this study would also seem to be akin to present moment awareness in the psychological flexibility model.

As expected, increased SWB predicted reduced FM-related difficulties such as pain, fatigue, anxiety and depression. The model was further improved by adding a direct path between decentering and FM-related difficulties. Together, SWB and decentering accounted for a large amount of the variance in FM-related difficulties (54%). This finding is an important contribution to the existing literature in that, as far as the author is aware, it is the first study to look at SWB in the FM population. Given that it is well-documented that the presence of well-being is more than the lack of distress [26], this finding is of considerable importance.

Limitations

There are several limitations to be acknowledged. Firstly, the goodness of fit indices suggested that the model was an acceptable rather than good fit and so the findings should be interpreted with caution. Modifying the model to better represent how the processes of psychological flexibility leads to change in SWB may be one way to improve the model fit.

Secondly, although SEM tests theoretically-defined causal models, the data explored in this study was cross-sectional so the direction of the effects reported cannot be inferred with absolute certainty. It may be, for example, that fewer FM-related difficulties predicts higher SWB. Nonetheless, the model was consistent with theoretical reasoning based on existing literature. To be more confident of the direction of effects, longitudinal experimental studies are needed. Ideally this would involve trials of interventions designed to improve mindfulness and hope. Pre- and post-comparisons could then be used to see if increased mindfulness and hope lead to later increases in SWB and improvements in FM-related difficulties.

Thirdly, the study used measures of state hope and state affect, rather than trait measures. This means the findings regarding hope and affect may have been influenced by how participants felt on the day as opposed to being a reflection of their general disposition. Both state and trait hope and state and trait affect have been shown to be highly correlated [37,43], but despite this, the distinction between state and trait affect may still be important. Within the context of chronic pain, the Dynamic Affect Model [46,47] would suggest that it is a person's ability to maintain higher levels of state PA during times of pain that is important to coping. In contrast, the more established broaden-and-build hypothesis of positive affect [19], would suggest that consistently higher trait PA broadens ones "*thought-action repertoire*" allowing for the development of a range resources that are then available as coping skills at times of stress. Future research should investigate whether the findings of this paper are applicable to trait affect.

Fourthly, as data were collected online it was not possible to verify that participants met the inclusion criteria for the study, most notably a diagnosis of FM. Reasonable steps were taken to

address this. Inclusion criteria was made clear in the study advert, participant information sheet and consent form. Participants were also asked to confirm that they had received a formal diagnosis prior to completing the study measures. Moreover, the study was only advertised through FM charities.

Lastly, the study opted not to collect further demographic data on education and employment and marital status to reduce participation time. Although past research has suggested that demographic variables account for only a small proportion of the variance in SWB [17], it still may have been of benefit to control for demographic factors.

Clinical Implications and Future Research

This study has three main implications for clinical practice and future research. The first is the need to further investigate which factors are associated with promoting SWB in the FM population. This research suggests acceptance, goal-focused hope and decentering all contribute to SWB. SEM suggested that a model which hypothesised that decentering partially mediated the relationship between acceptance and hope and SWB was an adequate fit, but that there was room for improvement. Future research should instead seek to test the legitimacy of models specifically based on psychological flexibility.

The second implication is that clinicians working with individuals with FM should routinely assess their levels of SWB, and engage in interventions which aim to improve SWB where necessary. Psychological flexibility is at the heart of Acceptance and Commitment Therapy [24] so this would be the obvious intervention to consider. There is growing evidence that ACT is indeed an efficacious treatment for FM [44] as well as the wider chronic pain population [8,11,29].

Lastly, measures of SWB should be included as a main outcome in studies that investigate the efficacy of interventions for FM. Studies which solely rely on measuring reduction in symptomology as a sign of effectiveness are not measuring the impact treatments may or may not have on well-being. This study has demonstrated that individuals with higher SWB reported less FM symptoms, including pain, fatigue, anxiety and depression, and also that FM had less of a debilitating impact on their lives.

Conclusion

In conclusion, the present study is the first to show that increased SWB is associated with a significant reduction in reported FM-related difficulties. Moreover, SEM demonstrated that mindfulness, goal-focused hope and decentering were all significant contributors to the promotion of SWB within the FM population. A model whereby decentering mediated the relationships between goal-focused hope and SWB, as well as mindfulness and SWB proved to be an adequate but not good fit. This provides grounds for future investigation of precisely how these concepts bring about increased SWB, and thus how they might be utilised effectively in the treatment of FM.

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Appendices

Appendix A

Defining and Distinguishing Mindfulness and Decentering

Bishop and colleagues (2004) endeavoured to reach an operational definition of mindfulness in response to an existing lack of consensus within the research community. They arrived at a two-faceted model. The first component is the capacity for the sustained self-regulation of attention which allows an individual to stay engaged in the present moment. The second component is the capacity to maintain an acceptance and curiosity to all of one's thoughts, feelings and sensations.

In comparison, in developing the Experience Questionnaire (EQ) as a measurement of decentering, Fresco *et al.* describe decentering based on Safran and Segal's influential (1990) definition as: *"ability to observe one's thoughts and feelings as temporary, objective events in the mind, as opposed to reflections of the self that are necessarily true."* (Fresco *et al.*, 2007 p. 234).

Fresco and colleagues explicitly state that they do not see their definition (and subsequent EQ tool) as synonymous with mindfulness as defined above by Bishop *et al.* (2004); rather, they feel it is complimentary to it. They also note that Bishop and colleagues themselves consider mindfulness and decentering *"within the same general domain"* but without either being redundant. To clarify, mindfulness may enable an individual to focus on the thoughts in the present moment with acceptance and curiosity, but it is the process of decentering that specifically facilitates the individual to recognise that the thoughts they are noticing are just thoughts, as opposed to definite truths about the self.

In summary, a plausible stance regarding the separateness of mindfulness and decentering based on the above would be that to engage with mindfulness may well lead to adopting a decentered stance, but to be decentered is not necessarily to be mindful as there appears to be other paths that lead to a decentered stance that do not involve mindful meditation. Fresco and colleagues' conceptualisation of decentering would imply that it is a mediating mechanism of change in both mindfulness- and cognitive-based therapies. Therefore, it would be reasonable to investigate

decentering as a mediator in the relationship between mindfulness and SWB. This would also fit with other existing models of change in mindfulness-based therapies that posit constructs akin to decentering, such as "metacognitive awareness" (Segal, Williams & Teasdale, 2002) and "reperceiving" (Shaprio, Carlson, Astin & Freedman, 2006) as the mechanism of change in mindfulness-based interventions

In an attempt to minimise the potential for overlap in measurements of the two concepts, the Philadelphia Mindfulness Scale (Cardaciotto, Herbert, Forman, Moitra & Farrow, 2008) was specifically chosen as a measurement of dispositional mindfulness as it was constructed based on the Bishop and colleagues conceptualisation of mindfulness. As such, it is restricted to the measurement of two subscales that aim to measure the two defined facets: the capacity for the sustained self-regulation of attention and the capacity to maintain an accepting and curious stance.

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Appendix B
State Hope Scale

Read each item carefully. Select the response that best describes you.

1. If I should find myself in a jam, I could think of many ways to get out of it.

○ Definitely False
○ Mostly False
○ Somewhat False
○ Slightly False
○ Slightly True
○ Somewhat True
○ Mostly True
○ Definitely True

2. At the present time, I am energetically pursuing my goals.

○ Definitely False
○ Mostly False
○ Somewhat False
○ Slightly False
○ Slightly True
○ Somewhat True
○ Mostly True
○ Definitely True

3. There are lots of ways around any problem that I am facing now.

○ Definitely False
○ Mostly False
○ Somewhat False
○ Slightly False
○ Slightly True
○ Somewhat True
○ Mostly True
○ Definitely True

4. Right now, I see myself as being pretty successful.

○ Definitely False
○ Mostly False
○ Somewhat False
○ Slightly False
○ Slightly True
○ Somewhat True
○ Mostly True
○ Definitely True

5. I can think of many ways to reach my current goals.

○ Definitely False
○ Mostly False
○ Somewhat False
○ Slightly False
○ Slightly True
○ Somewhat True
○ Mostly True
○ Definitely True

6. At this time, I am meeting the goals that I have set for myself.

○ Definitely False
○ Mostly False
○ Somewhat False
○ Slightly False
○ Slightly True
○ Somewhat True
○ Mostly True
○ Definitely True

Appendix C

Philadelphia Mindfulness Scale

Please circle how often you experienced each of the following statements within the past week.

1. I am aware of what thoughts are passing through my mind.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

2. I try to distract myself when I feel unpleasant emotions.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

3. When talking with other people, I am aware of their facial and body expressions.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

4. There are aspects of myself I don't want to think about.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

5. When I shower, I am aware of how the water is running over my body.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

6. I try to stay busy to keep thoughts or feelings from coming to mind.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

7. When I am startled, I notice what is going on inside my body.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

8. I wish I could control my emotions more easily.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

9. When I walk outside, I am aware of smells or how the air feels against my face.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

10. I tell myself that I shouldn't have certain thoughts.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

11. When someone asks how I am feeling, I can identify my emotions easily.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

12. There are things I try not to think about.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

13. I am aware of thoughts I'm having when my mood changes.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

14. I tell myself that I shouldn't feel sad.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

15. I notice changes inside my body, like my heart beating faster or my muscles getting tense.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

16. If there is something I don't want to think about, I'll try many things to get it out of my mind.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

17. Whenever my emotions change, I am conscious of them immediately.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

18. I try to put my problems out of mind.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

19. When talking with other people, I am aware of the emotions I am experiencing.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

20. When I have a bad memory, I try to distract myself to make it go away.

○	○	○	○	○
Never	Rarely	Sometimes	Often	Very Often

Appendix D

Experiences Questionnaire

We are interested in your recent experiences. Below is a list of things that people sometimes experience. Next to each item are five choices: “never”, “rarely”, “sometimes”, “often”, and “all the time”. Please select one of these to indicate how much you currently have experiences similar to those described. Please do not spend too long on each item – it is your first response that we are interested in. Please be sure to answer every item.

1. I am better able to accept myself as I am.

○	○	○	○	○
Never	Rarely	Sometimes	Often	All the time

2. I can slow my thinking at times of stress.

○	○	○	○	○
Never	Rarely	Sometimes	Often	All the time

3. I notice that I don't take difficulties so personally.

○	○	○	○	○
Never	Rarely	Sometimes	Often	All the time

4. I can separate myself from my thoughts and feelings.

○	○	○	○	○
Never	Rarely	Sometimes	Often	All the time

5. I can take time to respond to difficulties.

○	○	○	○	○
Never	Rarely	Sometimes	Often	All the time

6. I can treat myself kindly.

○	○	○	○	○
Never	Rarely	Sometimes	Often	All the time

7. I can observe unpleasant feelings without being drawn into them.

○	○	○	○	○
Never	Rarely	Sometimes	Often	All the time

8. I have the sense that I am fully aware of what is going on around me and inside me.

○	○	○	○	○
Never	Rarely	Sometimes	Often	All the time

9. I can actually see that I am not my thoughts.

○	○	○	○	○
Never	Rarely	Sometimes	Often	All the time

10. I am consciously aware of a sense of my body as a whole.

○	○	○	○	○
Never	Rarely	Sometimes	Often	All the time

11. I can view things from a wider perspective.

○	○	○	○	○
Never	Rarely	Sometimes	Often	All the time

Appendix E
Satisfaction with Life Scale

Below are five statements with which you may agree or disagree. Please indicate your agreement with each item by selecting the most appropriate response. Please be open and honest in your responding.

1. In most ways my life is close to my ideal.

○ Strongly Disagree
○ Disagree
○ Slightly Disagree
○ Neither Agree or Disagree
○ Slightly Agree
○ Agree
○ Strongly Agree

2. The conditions of my life are excellent.

○ Strongly Disagree
○ Disagree
○ Slightly Disagree
○ Neither Agree or Disagree
○ Slightly Agree
○ Agree
○ Strongly Agree

3. I am satisfied with life.

○ Strongly Disagree
○ Disagree
○ Slightly Disagree
○ Neither Agree or Disagree
○ Slightly Agree
○ Agree
○ Strongly Agree

4. So far I have gotten the important things I want in life.

○ Strongly Disagree
○ Disagree
○ Slightly Disagree
○ Neither Agree or Disagree
○ Slightly Agree
○ Agree
○ Strongly Agree

5. If I could live my life over, I would change almost nothing.

○ Strongly Disagree
○ Disagree
○ Slightly Disagree
○ Neither Agree or Disagree
○ Slightly Agree
○ Agree
○ Strongly Agree

Appendix F
Positive and Negative Affect Scale

This scale consists of a number of words that describe different feelings and emotions. Read each item and then list the number from the scale below next to each word. Indicate the extent you have felt this way over the past week.

1. Interested

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

2. Distressed

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

3. Excited

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

4. Upset

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

5. Strong

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

6. Guilty

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

7. Scared

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

8. Hostile

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

9. Enthusiastic

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

10. Proud

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

11. Irritable

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

12. Alert

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

13. Ashamed

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

14. Inspired

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

15. Nervous

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

16. Determined

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

17. Attentive

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

18. Jittery

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

19. Active

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

20. Afraid

○	○	○	○	○
Very slightly or Not at all	A Little	Moderately	Quite a bit	Extremely

Appendix G
Revised Fibromyalgia Impact Questionnaire

For each of the following 9 questions check the box that best indicates how much your fibromyalgia made it difficult to perform each of the following activities during the past 7 days. If you did not perform a particular activity in the last 7 days, rate the difficulty for the last time you performed the activity. If you can't perform an activity, check the last box.

Brush or comb your hair

No difficulty ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Very difficult

Walk continuously for 20 minutes

No difficulty ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Very difficult

Prepare a homemade meal

No difficulty ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Very difficult

Vacuum, scrub or sweep floors

No difficulty ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Very difficult

Lift and carry a bag full of groceries

No difficulty ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Very difficult

Climb one flight of stairs

No difficulty ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Very difficult

Change bed sheets

No difficulty ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Very difficult

Sit in a chair for 45 minutes

No difficulty ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Very difficult

Go shopping for groceries

No difficulty ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Very difficult

For each of the following 2 questions, check the box that best describes the overall impact of your fibromyalgia over the last 7 days:

Fibromyalgia prevented me from accomplishing goals for the week

Never ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Always

I was completely overwhelmed by my fibromyalgia symptoms

Never ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Always

For each of the following 10 questions, select the box that best indicates your intensity of these common fibromyalgia symptoms over the past 7 days:

Please rate your level of pain

No pain ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Unbearable pain

Please rate your level of energy

Lots of energy ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ No energy

Please rate your level of stiffness

No stiffness ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Severe stiffness

Please rate the quality of your sleep

Awoke well ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Awoke very tired rested

Please rate your level of depression

No depression ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Very depressed

Please rate your level of memory problems

Good memory ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Very poor memory

Please rate your level of anxiety

Not anxious ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Very anxious

Please rate your level of tenderness to touch

No tenderness ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Very tender

Please rate your level of balance problems

No imbalance ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Severe imbalance

Please rate your level of sensitivity to loud noises, bright lights, odours and cold

No sensitivity ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Extreme sensitivity

Appendix H

Overview of the Ethic Approval Process

The first stage in developing this study was to submit a research proposal which outlined a brief review of the relevant literature, the main research question and hypotheses, as well as the planned study methodology and analysis to the Division of Clinical Psychology Research Committee for peer review. A response was received on 13th November 2012 advising some minor amendments to the proposal. The reviewer comments were discussed with the research supervisors, and the proposal was revised accordingly. A response was sent to the committee on 3rd January 2013 which specified how the comments had been addressed, along with a revised copy of the research proposal. A letter confirming that the Division of Clinical Psychology Research Committee formally approved the proposal was received on 27th February 2013.

The second stage, which ran somewhat in parallel to the first and third stage, was to seek support from FM charities to advertise the study. Fibromyalgia UK and Fibroaction were identified as national UK charities with large online communities. As such, enquiries were made as to whether they would consider advertising the study to their members. Both charities provisionally agreed to advertise the study via their websites and social media pages, pending ethical approval.

The third stage of creating the current study was to apply for ethical approval. The study aimed to recruit a community sample of individuals living with FM, as opposed to recruiting from NHS services. The reason behind this decision was that it was hypothesised that it would be possible to target a more heterogeneous sample, from people who were living well with FM to those who had more difficulties because of it. In this sense, the study sample represented a non-clinical sample and ethical approval was sought from the Institute of Psychology, Health and Society (IPHS) Research Ethics Committee. The following documents were submitted to IPHS Research Committee:

- Application form for approval of a project involving human participants, human data, or human material

- Participant information sheet
- Consent form
- Debriefing page
- Study adverts
- Study measures
- Research proposal

The IPHS granted the project ethical approval on 8th May 2013 via expedited review.

Appendix I

Participant Information sheet.

UNIVERSITY OF LIVERPOOL

Title of Study

Well-Being in Fibromyalgia.

Thank you for taking the time to read this information sheet.

You are being invited to take part in an online questionnaire study. Before you decide whether to you wish to take part in the study or not, please read the following information carefully. The following information will explain why the research is being done, what you will be asked to do, and about confidentiality. Please take time to read the following information carefully and feel free to ask us if you would like more information or if there is anything that you do not understand. If you would like anymore information or have any questions please contact me or my supervisor using the contact details below. Please also feel free to discuss this with your friends, relatives or GP if you wish.

To take part you must be 18 years or older, and a resident of the United Kingdom.

As a thank you for completing the questionnaire, you will be given the opportunity to enter a prize draw where you can win either 1 x 50 or 10 x £10 high street store vouchers.

What is the purpose of the study?

The purpose of the study is to explore which psychological factors may contribute to well-being in people with Fibromyalgia. There has been lots of research that shows that people with physical health conditions (such as Fibromyalgia) who maintain higher levels of well-being do well, for example they live longer, and need to have less healthcare appointments

Why have I been chosen to take part?

As we are interested in learning more about how to improve well-being in individuals with Fibromyalgia, we are specifically looking for individuals with a diagnosis of the condition. Furthermore, we are only inviting individuals who are over the age of 16 and residents of the United Kingdom to take part for ethical reasons to do with gaining appropriate consent to take part.

Do I have to take part?

No, **taking part is voluntary**. If you don't want to take part, you do not have to give a reason and no pressure will be put on you to try and change your mind. You can stop the questionnaire at any time. Incomplete questionnaires will be permanently deleted from the data set.

What will happen if I take part?

If you agree to take part, you will first be asked to check that this study is right for you, and that you are happy to take part.
You will then be asked to complete a set of online questionnaires.

We estimate that the questionnaire shall take no longer than 20 minutes to complete in a single, non-stop sitting. However, if you would feel more comfortable taking breaks, it is okay to leave the questionnaire from time to time, before returning to carry on. If you would like to do this, it is important to leave you computer switched on, and the questionnaire up on the screen. If you were to close the internet browser, or log off the computer then your answers so far would be lost.
All questions will be presented in English; unfortunately no other language options are available. As such you may want to consider if this will cause difficulties for you in anyway before agreeing to take part. You can do this in any location you choose. Though none of the questions are of a very personal nature, you may still wish to pick somewhere with reasonable privacy.

Once you have completed the questionnaire, you will have finished the study. There will be no further questionnaires or any other kind of follow up in the future.

Expenses and / or payments

At the end of the study, you will be offered the opportunity to enter a prize draw to win prizes of High Street Vouchers. The prizes available are: 1 x First Prize of £50 high street vouchers, 10 x Runner up Prizes of £10 high street vouchers. If you wish to be entered into the draw, you will be asked to provide your email address. Once the study closes, the draw will take place and you will be informed by email whether or not you have won a prize. You're email address will be stored in a separate place to your questionnaire answers to ensure you anonymity.

Are there any risks in taking part?

There are no anticipated risks to taking part. If any of the questions raise concerns you are advised to contact your GP for support, and/or discuss them with someone you trust.

You can also gain support by contacting an independent support organisation such as The Samaritans: 08457 90 90 90 or www.samaritans.org

Are there any benefits in taking part?

There are no immediate benefits to participating in the research, besides the chance to win high street vouchers should you wish to enter the prize draw at the end.

What if I am unhappy or if there is a problem?

Please contact Kathryn Bourne (kbourne@liverpool.ac.uk) who will try to help. If you remain unhappy or have a complaint which you feel you cannot come to us with then you should contact the Research Governance Officer on 0151 794 8290 (ethics@liv.ac.uk). When contacting the Research Governance Officer, please provide details of the name or description of the study (so that it can be identified), the researcher(s) involved, and the details of the complaint you wish to make.

Will my participation be kept confidential?

If you choose to take part in the study, any information you give will be anonymised i.e. no one will know your identity. Your responses will only be viewed by the researchers involved in the study. If you choose to take part in the study and then decide it is not for you, you will be able to withdraw at any time **during** the online questionnaire. You can do this by closing the internet browser. Incomplete data sets will be deleted from the study data. However, once you have fully completed the study, it will unfortunately not be possible to withdraw your data as there will be no way of identifying which set of answers is your own.

What will happen to the results of the study?

The results of the study will be written up as part of a Doctoral Degree in Clinical Psychology. The study may also be published in an academic journal. A summary of the anonymised results will be posted on the Fibromyalgia UK and Fibroaction websites.

What will happen if I want to stop taking part?

You have the right to stop answering the questionnaire at any point, without needing to give any explanation. Should you wish to do this, simply close the internet browsing window you are doing the questionnaire on. Any questionnaires that are not answered until the end will be withdrawn from the study and permanently deleted. Unfortunately, once you have completed the study it will not be possible to ask for your data to be removed, as we will have no way of identifying which sets or answers are your own.

Who can I contact if I have further questions?

Kathryn Bourne
Trainee Clinical Psychologist
Doctorate of Clinical Psychology Programme
University of Liverpool
Email: kbourne@liverpool.ac.uk

This study is supervised by Dr Jen Unwin at Southport & Ormskirk Hospital Trust and Dr Joanne Dickson at the University of Liverpool.

Appendix J
Consent Form

Title of Research Project:	Well-Being in Fibromyalgia	
Researcher(s)	Kathryn Bourne Dr Joanne Dickson (Chief Investigator) Dr Jen Unwin	**Please check box**

1. I confirm that I am 18 years of age or older. ☐
2. I confirm that I am a resident of the United Kingdom. ☐
3. I confirm that I have read and have understood the information sheet dated [DATE] for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
4. I understand that my participation is voluntary and that I am free to stop taking part at any time without giving any reason, without my rights being affected. ☐
5. I agree to take part in the above study. ☐

The contact details of lead Researcher are:

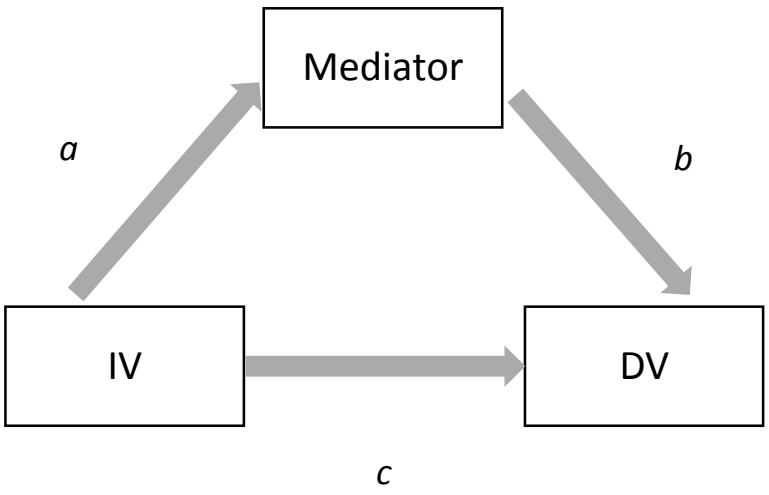
Kathryn Bourne
Trainee Clinical Psychologist
Doctorate of Clinical Psychology Programme
University of Liverpool
Email: kbourne@liverpool.ac.uk

Appendix K

Structural Equation Modelling (SEM)

SEM is largely a confirmatory, as opposed to exploratory, approach that involves the testing of a hypothesised structural model of how variables of interest relate to each other. Put simply, SEM works by estimating an implied "perfect" covariance matrix and parameters based on the hypothesised structural model. It then compares the actual observed data to the implied model to see how well it fits. Most SEM programmes produce a number of goodness of fit indices that can be used to infer how well the model fits the data (Byrne, 2010). The most common of which are discussed below.

The advantages of using an SEM approach in this study is that it allowed for the conducting of simultaneous equations that looked at multiple relationships amongst multiple variables at the same time. For example in SEM it is possible to estimate: the direct effect (*c)* an IV has on a given DV, the indirect effect *(ab)* an IV may have on a given DV through a hypothesised mediating variable, and also the total effect *(c + ab)* that the IV has on the given DV, all in one step. The example given is a simple mediation analysis for clarity of explanation. SEM's true strength, however, is that it allows for the testing of much more complicated models that may have multiple IVs, mediating variables and DVs.



SEM can be performed using a number of possible estimation methods, the most common of which is the Maximum Likelihood Method (ML). The ML approach makes the assumptions that (i) the data sample is large, (ii) the variables are normally distributed, and (iii) the distribution of the observed variables has multivariate normality (Byrne, 2010).

When estimating the model, AMOS will provide several Goodness of Fit Indices (GFI). Although there is no absolute rules about which GFIs to report, the generally agreed consensus is to report the chi-square value (χ^2), the comparative fit index (CFI), the root mean square error of approximation (RMSEA) and the standardised root mean square residual (RMSR) (Hu and Bentler, 1999).

The χ^2 tests the null hypothesis that the proposed model is no different from the actual data. As such, a non-significant result indicates a well-fitting model. However, the χ^2 is very sensitive to sample size so that in large sample sizes the χ^2 is very likely to be significant (Byrne, 2010).

The RMSEA is a 'parsimony' index measure that penalises models that estimate many parameters, but rewards bold models with more constraints. It normally favours the model with fewer parameters, unless additional parameters make a considerable improvement to model fit. It compares the fit of a saturated model (in which it is assumed that everything is related) to the hypothesised model, whilst adjusting for complexity using the error per degree of freedom. A score of $\leq .06$ indicates good fit (Hu & Bentler, 199), with scores over 1.00 indicating a poor fit (Byrne, 2010).

The CFI is an incremental analysis of fit that compares the χ^2 of the tested model to the χ^2 null model, whilst accounting for sample size. CFI values range from 0 to 1, with values $\geq .95$ indicating a good fit (Hu & Bentler, 1999).

The SRMR is a measure of fit based on the difference between residuals in the observed model and the hypothesised model. Values range from 0 to 1, with values $\leq .08$ indicating a good fit (Hu & Bentler, 1999).

References

Byrne, B. (2010). *Structural equation modeling with AMOS: Basic concepts, applications, and programming*. London: Routledge.

Hu, L. & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling - a Multidisciplinary Journal, 6,* 1-55. doi: 10.1080/10705519909540118.

Appendix L

Data Preparation

The online questionnaire was a forced-choice design, which meant that participants had to respond to all study items on a page in order to continue to the next page and complete the study. It was made clear to participants that if they did not want to answer any questions they could opt out of the study by closing their browser window and that any incomplete data sets would be treated as withdrawals and removed from the final sample. The study link was accessed approximately 2,440 times and 1,169 people started the study. Of those who started the study, 186 did not complete all the questions, 23 were identified as duplicates and 24 reported that they did not have a diagnosis of FM. As such, for the 936 participants included in the analysis there was no missing data.

Subscale and or total scores were computed in SPSS as per the instructions of each measure. The next step was to asses for skewness and kurtosis within each of the key study variables. As the data set was very large, this was likely to bias traditional tests of normality within SPSS, such as the Shapiro-Wilk test, as well as methods of assessing normality via calculating the z-scores for the skewness and kurtosis values (Field, 2013). Therefore, it was decided that the most meaningful method of assessing normality was to look at the distribution of data for each variable using histograms. This process revealed that SWLS, PA and Hope scores were all somewhat positive skewed. A log transformation was applied and a subsequent review of the histograms of the transformed variables revealed them to be acceptable.

References

Field, A. (2013). *Discovering Statistics using SPSS (4th Edition).* London: SAGE.

Appendix M

Comparing descriptive statistics with normative data

The sample means for each variable in the current study were compared to previously reported normative data. All of the comparative samples consisted of non-clinical participants, with the exception of the measure of decentering (EQ, Fresco *et al.*, 2007), which reported a mixed sample of non-clinical participants and participants in remission from Major Depressive Disorder. Independent t-tests were used to see whether the norms of the current sample were statistically different to those reported previously. The descriptive data and t-test statistics are reported in the table overleaf. Participants in the current sample reported significant lower levels of SWL, PA, hope, mindful acceptance and decentering. The current sample also reported significantly higher levels of NA and FM-related difficulties. There was no statistical difference between mindful awareness in the current sample and that reported previously.

	Current Sample (n = 936)		Comparative data			
Variable	Mean	SD	Mean	SD	t	p
SWL[a]	14.66	7.05	23.50	6.43	15.47	<.001
PA[b]	23.35	8.45	31.31	7.65	21.77	<.001
NA[b]	26.31	9.35	16.00	5.90	29.24	<.001
Hope[c]	23.43	10.68	37.15	6.33	25.06	<.001
M'ful Aware[d]	36.48	5.94	36.65	4.93	0.60	n.s.
M'ful Accept[d]	25.31	6.60	30.49	5.84	15.32	<.001
Decentering[e]	3.00	0.63	3.28	0.91	5.77	<.001
FIQR[f]	68.54	18.52	56.60	19.90	8.20	<.001

Note. SWL = Satisfaction with Life Scale; PA = Positive Affect; NA = Negative Affect, M'ful Aware = Mindful Awareness; M'ful Accept = Mindful Acceptance; FIQR = Fibromyalgia Impact Questionnaire Revised.

[a] *comparative sample from Deiner et al. (1985), N = 176.*

[b] *comparative sample from Crawford & Henry (2004), N = 1003.*

[c] *comparative sample from Snyder et al. (1996), N = 444.*

[d] *comparative sample from Cardaciotto et al. (2008), study 2, N = 559.*

[e] *comparative sample from Fresco et al. (2007), sample 3, N = 270.*

[f] *comparative sample from Bennett et al. (2009), N = 202.*

References

Bennett, R. M., Friend, R., Jones, K. D., Ward, R., Han, B. K. & Ross, R. L. (2009). The Revised Fibromyalgia Impact Questionnaire (FIQR): validation and psychometric properties. *Arthritis Research & Therapy, 11,* R120. doi: 10.1186/ar2783.

Cardaciotto, L., Herbert, J. D., Forman, E. M., Moitra, E. & Farrow, V. (2008). The assessment of present-moment awareness and acceptance - The Philadelphia Mindfulness Scale. *Assessment, 15,* 204-223. doi: 10.1177/1073191107311467.

Crawford, J. R. & Henry, J. D. (2004). The positive and negative affect schedule (PANAS): Construct validity, measurement properties and normative data in a large non- clinical sample. *British Journal of Clinical Psychology, 43,* 245-265. doi: 10.1348/0144665031752934

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Fresco, D. M., Moore, M. T., van Dulmen, M. H. M., Segal, Z. V., Ma, S. H., Teasdale, J. D. & Williams, J. M. G. (2007). Initial psychometric properties of the Experiences Questionnaire: Validation of a self-report measure of decentering. *Behavior Therapy, 38,* 234-246. doi: 10.1016/j.beth.2006.08.003.

Snyder, C. R., Sympson, S. C., Ybasco, F. C., Borders, T. F., Babyak, M. A. & Higgins, R. L. (1996). Development and validation of the State Hope Scale. *Journal of Personality and Social Psychology, 70,* 321-335. doi: 10.1037//0022-3514.70.2.321.

Appendix N

Covariance, Residual Covariance and Standardised Residual Covariance Matrices for the modified Model.

Covariance Matrix

	Aware	**Accept**	**Hope**	**Decenter**	**FM**	**NA**	**PA**	**SWL**
Aware	35.28							
Accept	-9.16	43.53						
Hope	0.24	0.46	0.05					
Decentre	17.52	11.82	0.93	48.36				
FM	-4.66	-46.56	-2.34	-46.69	342.78			
NA	-5.99	-23.40	-1.25	-31.62	92.45	87.40		
PA	0.10	0.40	0.02	0.54	-1.56	-0.59	0.03	
SLW	0.12	0.46	0.03	0.63	-1.83	-0.95	0.02	0.05

Unstandardised Residual Matrix

	Aware	Accept	Hope	Decenter	FM	NA	PA	SWL
Aware								
Accept	0.00							
Hope	0.00	0.00						
Decenter	0.00	0.00	0.00					
FM	-2.02	2.97	-0.01	0.00				
NA	5.21	-9.19	0.15	0.89	3.29			
PA	.11	-0.14	0.00	0.05	0.08	0.00		
SWLS	-.08	-0.04	0.00	-0.10	-0.15	0.01	0.00	

Standardised Residual Matrix

	Aware	Accept	Hope	Decenter	FIQR	NA	PA	SWL
Aware								
Accept	0.00							
Hope	0.00	0.00						
Decenter	0.00	0.00	0.00					
FM	-0.56	0.69	-0.07	0.00				
NA	2.85	-4.26	1.86	0.38	0.51			
PA	3.45	-3.62	1.50	1.26	0.75	0.00		
SWL	-1.93	-0.78	0.97	-1.93	-1.02	0.14	-0.30	

Note. Aware = mindful awareness; Accept = mindful acceptance; Decenter = Decentering; FM = fibromyalgia-related difficulties: NA = negative affect: PA = positive affect; SWL = satisfaction with life.

Appendix O
PAIN: Author Guidelines

Comprehensive Reviews

Comprehensive reviews offer an extensive summary of an important topic, field, discovery, or innovation. Narrative, comprehensive reviews are encouraged where they offer insight across traditional domains, focus on methods and measurement, or introduce conceptual or philosophical direction. Such reviews are discouraged for evidence synthesis or for the summary of research results where meta-analyses are possible. Comprehensive reviews should be well-illustrated with high-quality figures. There is no specific word limit, but reviews longer than 6,000–8,000 words are discouraged. The manuscript must contain an Abstract (unstructured, 250 words) Introduction, Methods, Results, Discussion, Acknowledgments, and References.

Clinical/Basic Science Research Reports

The manuscript must contain an Abstract (unstructured, 250 words), Introduction (500 words), Methods (no word limit), Results (no word limit), Discussion (1,500 words), Acknowledgments, and References.

General Guidelines

File format should be Microsoft Word, and manuscript pages should be numbered. The title page should include the following: (i) complete title (preferably no chemical formulas or arbitrary abbreviations); (ii) full names of all authors; (iii) complete affiliations of all authors; (iv) the number of text pages of the entire manuscript (including pages containing figures and tables) and the actual number of figures and tables; (v) the author to whom correspondence should be sent and this author's complete mailing address, telephone number, fax number, and e-mail address, and, if available, institutional URL.

Acknowledgments. Place acknowledgments at the end of the text before the reference list and specify the following: (1) contributions that need acknowledging but do not justify authorship; (2) acknowledgments of technical help; (3) acknowledgments of financial and material support, specifying the nature of the support; (4) financial arrangements that may represent a possible conflict of interest. Conflict of Interest. A Conflict of Interest statement must be included for all manuscripts within the Acknowledgments section. Even if there are no conflicts of interest, please explicitly state this.

Referencing

- Cite literature references in the text using bracketed numbers that correspond to the alphabetized and numbered reference list as follows: "Pain is made worse if you hit the already injured site [15]." For multiple references in the text, please use the format [number,number] (with a comma and no spaces). For example: [2,4,28,33].
- All references cited in the text must be listed at the end of the paper. They should be numbered, double spaced, and arranged alphabetically by first author last name.
- All authors must be listed in the references; the use of et al. is not acceptable.
- References must be complete, including initial(s) of author(s) cited, title of paper, journal, year of publication, and volume and page numbers.
- For citations of books, the following uniform sequence should be maintained: author(s), title of article, editor(s), complete title of book, place of publication, publisher, year, and page numbers.
- Journal titles should be abbreviated according to the National Library of Medicine's Index Medicus. Please refer to the NLM website's FAQ on how to find Index Medicus journals: www.nlm.nih.gov/services/aim.html.
- Unpublished data, personal communications, abstracts that cannot be retrieved by casual readers (e.g., meeting abstracts that require logging into a members-only site), and other inaccessible materials should not be listed as references. Unpublished materials may be cited in parentheses within the text.

- For manuscripts containing citations that are in press, authors must have electronic copies immediately available in case reviewers/editors request these materials.
- URLs should be included for all references that are publicly accessible via the Internet.

Examples:

[1] Adams CWM. Neurohistochemistry. Amsterdam: Elsevier, 1965.

[2] Apkarian AV, Bushnell MC, Treede RD, Zubieta JK. Human brain mechanisms of pain perception and regulation in health and disease. Eur J Pain 2005;9:463-84.

[3] Eccles R. Understanding the symptoms of the common cold and influenza. Lancet Infect Dis 2005;5:718-25.

[4] Turner JA. Coping and chronic pain. In: Bond MR, Charlton JE, Woolf CJ, editors. Pain research and clinical management. Proc. VIth World Congress on Pain, Vol. 4. Amsterdam: Elsevier,; 1991. pp. 219-227.

Figure legends

Provide each illustration with a title and an explanatory legend. The title should be part of the legend; do not reproduce the title and legend on the figure itself. Legends should appear on a separate page at the end of the manuscript. Each legend should be numbered consecutively with Arabic numerals (i.e., Fig. 1, Fig. 2, etc.), and should begin with the number of the illustration to which they refer. Explain all symbols and abbreviations used in the figure.

Tables

Tables, with their captions and legends, should be intelligible with minimal reference to the text. Tables of numerical data should each be typed (double spaced) on a separate page, numbered in sequence with Arabic numerals (i.e., Table 1, Table 2, etc.), provided with a title/heading, and

referred to in the text as Table 1, Table 2, etc. Provide a detailed description of its contents and any footnotes below the body of the table.