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Assessing the Efficacy of Acceptance and Commitment Therapy in Reducing
Schema-enmeshment in Fibromyalgia Syndrome

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ASSESSING THE EFFICACY OF ACCEPTANCE AND COMMITMENT THERAPY IN REDUCING SCHEMA-ENMESHMENT IN FIBROMYALGIA SYNDROME

A Dissertation

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This work is dedicated to the women who volunteered to participate in this study and to anyone who struggles with chronic pain and illness.

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ABSTRACT

Steiner, Jennifer Leah. Ph.D., Purdue University, August 2013. Assessing the Efficacy of Acceptance and Commitment Therapy in Reducing Schema-enmeshment in Fibromyalgia Syndrome. Major Professor: Silvia M. Bigatti.

The presence of a chronic pain condition can have a profound impact on one’s self-concept. Some individuals may have had to make major lifestyle changes. As a result, some people may start to define themselves in terms of their pain, such that their self-schema and pain-schemas become intertwined in a process termed schema-enmeshment. It is thought that schema-enmeshment is related to psychological distress making it a prime target for intervention. Little research has been conducted on interventions to reduce schema-enmeshment. Acceptance-based interventions may be especially appropriate in reducing schema-enmeshment or the connection between self and illness symptoms as these interventions tend to emphasize learning to live with pain and other symptoms and to work toward important life goals rather than continually fighting against the condition and allowing it to control their life. This study is a randomized trial comparing Acceptance and Commitment Therapy (ACT) to education about pain management in a sample of women with Fibromyalgia Syndrome (FMS). The primary aim of this study was to assess the efficacy of ACT in reducing schema-enmeshment between self and pain, as well as enmeshment between self and other symptoms and FMS as a whole. In addition, this study also explored the role of pain acceptance, specifically activity engagement as a mediator of the relationship between treatment group membership and changes in schema-enmeshment. The data was analyzed as an intent-to-treat analysis using the “last measure carried forward” method. Results indicated that the ACT group reported statistically significant differences in self schema-enmeshment with FMS, fatigue, and cognitive symptoms, but not with pain, following the intervention, compared to the educational control group. In each of these cases, the ACT group experienced greater reductions in schema-enmeshment compared to the education group. Interestingly, no statistically significant differences were observed for schema-enmeshment with pain. Statistically significant group differences were also observed for acceptance of pain following the intervention. Finally, a mediational model in which changes in activity engagement (a form of pain acceptance) served as the mediator of the relationship between treatment group and changes in schema-enmeshment with FMS was tested. The model was tested using a bootstrapping method, and results revealed a trend toward a significant indirect effect of changes in activity engagement leading to changes in schema-enmeshment with FMS. Taken together, the results of this study indicate that ACT may be a promising intervention for targeting maladaptive beliefs about the self in relation to illness, especially schema-enmeshment of self with illness and illness symptoms. Additionally, there is evidence that ACT may target key constructs such as activity engagement, which may be related to other cognitive and behavioral changes. Future directions for research and clinical practice related to ACT as an intervention for FMS are discussed in depth.

INTRODUCTION

Fibromyalgia Syndrome (FMS) is a chronic, painful rheumatic condition for which there is currently no biological marker (Wolfe et al., 1995). FMS is characterized by recurrent musculoskeletal pain, fatigue, and nonrestorative sleep. The condition affects approximately 2-7% of the general population and is more common among women over the age of 40 (Wolfe et al., 1995). Because of the lack of a biological mechanism for diagnosis, FMS is currently diagnosed based on the presence of “tender points”. Tender points are small regions on the body that are sensitive or “tender” to the touch when pressure is applied. There are 18 specific tender points located throughout the body that are used to diagnose the syndrome. In order for an individual to receive a diagnosis of FMS, a rheumatologist must identify at least 11 painful tender points across several regions of the body (Wolfe et al., 1990). Due in part to the subjective nature of diagnosing this condition, patients with FMS often do not receive validation of their pain from those around them; women who suffer from this condition may feel isolated or rejected by society (Turk, 2002). For many years FMS was not even considered a true condition. However, the pain is very real and people with FMS are frequently hypersensitive to touch or tactile stimuli (Desmeules, Cadraschi, Rapiti, Finckh, Cohen, Dayer, & Vischer, 2004). This hypersensitivity can make simple actions like shaking hands or hugging very painful and may deter these interactions.

Possibly related to these factors, the prevalence of depression among individuals with FMS is significantly higher than the rates of depression among individuals with neuropathic pain (7.1% vs 3.1% respectively in Gormsen, Rosenberg, Bach, & Jensen, 2010), various rheumatic diseases (40% vs 8% respectively in Kurdland, Coyle, Winkler, & Zable, 2006) and other pain conditions (Hudson, Hudson, Pliner, Goldenberg, & Pope, 1985; Walker et al., 1997), although as these studies show, prevalence across FMS samples varies widely. Prevalence rates for depression in FMS as high as 88.2% have been reported when both major depressive disorder and atypical depressed episodes are included (Ross, Jones, Ward, Wood, & Bennett, 2010).

Additionally, psychological factors may in turn exacerbate the symptoms of the condition. Symptoms of depression have been found to contribute to an increase in pain intensity in patients with FMS (Hasset, Cone, Patella, & Sigal, 2000). Similarly, research has linked pain increases to an individual's beliefs about the ability to control health outcomes (Gustafsson & Gaston-Johansson, 1996) and to the fear of physical activity (Turk, Robinson, & Burwinkle, 2004), both of which have been found in patients with FMS. While there is sufficient evidence that psychological factors have an impact on the physical outcomes of the condition, namely pain intensity, it is still unclear what underlying processes are involved in the psychological factors mentioned above.

Effects of Chronic Pain and Illness on Identity

Ample research has demonstrated that individuals with chronic pain experience a change in self-concept (Harris, Morley, & Barton, 2003; Hellstrom, 2001; Leventhal, Idler, & Leventhal, 1999) after the onset of chronic pain. This may manifest as feeling as though they are someone different than they were prior to pain or that they have “lost” defining characteristics of their life and self. According to Leventhal (1999), chronic illness can often interfere with executing formerly manageable activities, creating an emphasis on what individuals *cannot* do. This emphasis on *in*abilities may in turn lead to changes in self-concept. These changes in self-concept or self-schema have been noted in patients with chronic low back pain, arthritis (Harris et al., 2003; Miles, Curran, Pearce, & Allan, 2005), chronic fatigue syndrome (Dickson, Knudsen, & Flowers, 2008), systemic lupus erythmatosus (Denton, Sharpe, & Schrieber, 2004), and most recently FMS (Steiner, 2009).

A common theme in the literature is the loss or death of the “past self”. Qualitative studies have provided compelling evidence that patients feel a loss of self as a result of living with a chronic illness (Corbin, 2003; Dickson, et al., 2008). One study found that individuals with chronic fatigue distinguished between their life prior to the onset of their illness and their current life (Dickson et al., 2008). The responses of individuals in this study were demonstrative of two different lives, or two different ideas about themselves. Several of the participants reported a sense that part of them was missing and they no longer felt they were truly themselves (Dickson et al., 2008). Smith and Osborne (2007) found similar self-reports in people with chronic low back pain; in their study, individuals’ responses included comment such as “I can’t be me” and “It’s the pain, it’s me”, possibly indicating an integration of self and pain. Similarly, Hellstrom (2001) found that chronic pain patients felt as though they were trapped by the present; they were neither able to recall their lives before the onset of pain nor were they capable of imagining a future unaffected by pain.

A *possible self* is an idea of what one could become based on representations of the self in both the past and future (Markus & Nurius, 1986). The inability to imagine a satisfying future self is known as a *negative possible self*. Negative possible selves are representative of a feared version of the self. People with chronic pain or illness may imagine their future self as confined to a wheelchair instead of being able bodied. Consequently, this construct of the possible self can become incorporated into the present self (Markus & Nurius, 1986). This may contribute to psychological distress which may lead to further changes in an individual’s self-concept (Marcus & Nurius, 1986). A similar change in self-concept is related an inability to live up to the *ideal self*. This is the version of the self the individual desires to become (Compan et al., 2011) and the inability to live up to this ideal may be partially related to all of the possibilities that are no longer deemed attainable after the onset of pain.

Because of the nature of FMS, one might expect that changes in self-concept would be common; however few studies have specifically aimed to understand the self in a sample of FMS patients. A recent study by Compan et al. (2011) compared 30 women with FMS to a group of women without that diagnosis, through a structured interview. Women with FMS were found to have a greater amount of discrepancy between their self and their ideal self than women in the control group. This research is consistent with other qualitative work with chronic pain patients.

In addition to changes in self-concept that are common in people with chronic pain and illness, some individuals start to attend to pain-related information to a greater extent than people who do not experience chronic pain (Haggman, Sharpe, Nicholas, & Refshauge, 2010; Liossi, Schoth, Bradley, & Mogg, 2008; Liossi, White & Schoth, 2011; Khatibi et al., 2009; Schoth & Liossi, 2010). This bias toward pain-related information can be thought of as a pain "filter" or "lens" through which all other information must pass ; this may be similar to the "mental filter" that is often described in cognitive therapy (Burns in Caudill, 2009). It is a tendency to see the world and one's self as being integrated with the pain or symptoms of their illness. A great deal of quantitative data has been collected on this pain bias. I recently evaluated 31 individual studies of pain-related biases in chronic pain (Steiner, 2011) and found that 80.8% (21/26 studies) supported the notion that chronic pain patients exhibit a bias toward pain-related information when compared to healthy controls. Attention to pain on a regular basis may serve to reinforce the idea that pain is an integral part of one's life or identity. Interestingly, although this bias has been well supported in the literature there have yet to be any interventions designed to target the pain bias or changes in identity, which is the primary aim of the study proposed here.

The Schema-Enmeshment Model of Pain

In 2001, the schema-enmeshment model of pain (SEMP; Pincus & Morley, 2001) was developed to serve as a framework for better understanding changes in self resulting from chronic pain. Self-schemas are "cognitive generalizations about the self, derived from past experience that organize and guide the processing of self-related information"

(Markus, 1977, pp 64). They are representations of how one perceives one's self, and these schemas are at the core of how a person defines the self and personal identity. The self-schema helps individuals to process and organize new information as either consistent or inconsistent with their concept of "self" (Markus, 1977). Although self-schemas are somewhat resistant to new information that is not viewed as "self like", major life changes such as the onset of chronic pain can modify the self-schema. Self-schemas are strongly influenced by one's perception of self (Markus, 1977) which may happen through processes described in self-perception theory (Bem, 1972). According to self-perception theory, we often observe our own behavior in order to make inferences about ourselves (Bem, 1972). In the case of chronic pain or FMS, an individual might observe that they are no longer able to participate in high impact activities and over time come to the conclusion that they are someone who is limited or defined by pain.

Research has provided support for the idea that some individuals with chronic pain conditions experience a change in self-schema or self-concept (Dickson et al., 2008; Morley et al., 2005). In these cases, the person's self-schema may change from one in which they were a well-adjusted healthy person to a self-schema of a person whose entire life is influenced by the pain. People may no longer be able to separate their ideas about pain (pain schema) and self (self-schema) into distinct entities. Instead, for some people the pain and self-schema may become one and the same, such that the person associates pain as an integral part of his or her identity. *Schema-enmeshment* is a term that has been used to describe this integration (Pincus & Morley, 2001), and is the focus of the study proposed here. According to Pincus and Morley (2001) there are three components or schemas in the Schema-Enmeshment Model of Pain (SEMP; see Figure 1): self, pain, and illness. If these three schemas significantly overlap and become enmeshed, distress and psychological problems such as depression may result, further exacerbating the chronic pain condition (see Figure 1).

The SEMP was originally developed based on the findings from research on pain-related information processing biases; however after carefully examining the research on IPBs, I suggested revisions to the SEMP (Steiner prelims, 2011). One of the most significant findings to come out of my recent review was that there are differences between sensory-pain information biases and affective-pain information biases. These findings are consistent with the notion that pain is not a unidimensional concept. Pain has been defined as “an unpleasant, sensory and emotional experience associated with actual or potential tissue damage or described in terms of such tissue damage” (IASP, 1979). By definition, pain has at least two distinct dimensions, sensation and affect. The physical sensations of pain such as aching, burning, or throbbing may carry a different meaning than the affective experience of pain, which may be associated with feelings of hopelessness, frustration, or misery (Steiner, 2011). Moreover, biases toward these dimensions are not equal. The literature revealed that there was substantial support for a bias toward sensory-pain related information among people with chronic pain; however bias toward affective pain information was present only when individuals had co-morbid depressive symptomology (Steiner, 2011). Differences often emerged between depressed pain patients and non-depressed pain patients, with only the depressed pain group displaying a bias toward affective information (Pincus, Pearce, McClelland, & Isenberg, 1995). It appears that the relationship between depression and enmeshment with pain or illness is a critical construct that needs further attention, as depression could potentially exacerbate pain and both depression and enmeshment may impact quality of life. Pincus and Morley (2001) suggested that biases (such as those mentioned above) led to the presence of schema-enmeshment with pain information, and this in turn results in psychological distress. Thus, it is important to study schema-enmeshment as this experience is likely related to psychological health and quality of life, which may already be somewhat impaired in women with FMS because of physical limitations.

Measuring the Impact of Illness on Self

One of the greatest challenges in this field is determining how to effectively measure the impact of illness on the self. The notion of "self" is by nature an abstract concept, and objective measurement of a subjective experience on an already indefinite construct is a difficult task. This may partially explain the attention to pain-related IPBs in the literature. Objective measures of recall and processing speed (such as the dot probe task or the Stroop) as a method of detecting bias toward pain words could provide one way of assessing the extent to which chronic pain has become associated with the self in one's cognitive network. Objective measures that assess cognitive biases related to pain are based on the principle that the brain organizes information into categories or schemas that allow us to process information efficiently (Markus, 1977). A commonly referred to theory and explanation of the way the brain processes incoming information is the *spreading activation theory* (Anderson, 1976; Ratcliff & McKoon, 1981). According to this conceptualization, information is organized into networks which are comprised of *nodes* or schemas. The greater the association between two nodes the less time it should take for the information to "travel" from one to the other. Although cognitive processing is more complex than this simplified theory, it serves to illustrate the fact that cognitive processing tends to be faster for related information (Fazio, Sabonmatsu, Powell, & Kardes, 1986). It is thought that this is especially relevant for information about the self (Markus, 1977); the more information is deemed to be associated with one's definition of self the more likely it is to be processed faster (Calfas, Ingram, & Kaplan, 1997; Markus, 1977) and stored in memory. It is because of these principles that measures of processing speed and recall have been assumed to be capable of assessing the magnitude of the relationship between self and pain.

Indeed a great amount of quantitative work on the relationship between self and pain has been conducted using these types of measures. Pincus and colleagues (1993) assessed the recall of pain-related words with chronic pain patients when the words were endorsed as either self-referential or in reference to another person. Chronic pain patients were found to recall a greater number of pain words when they were in reference to self than in reference to another person; the comparison group of people without pain displayed no significant differences in recall based on the subject of reference (Pincus et al., 1993). This is an example of how the self plays a role in determining the processing of information. Other studies evaluated differences between chronic pain patients and controls on recall of pain-related words (without explicit reference to self or other) and individuals with chronic pain recalled more pain words compared to individuals without pain (Pincus, Fraser, & Pearce, 1998; Pincus et al., 1995). It is assumed that because pain is relevant to people with chronic pain, they had greater recall.

In a similar manner, some assume that measures of processing speed such as the emotional Stroop task and Dot-probe assess a difficulty disengaging from pain related information. For example, in the emotional Stroop task individuals are presented with words (that fit into categories of pain, neutral, etc.) that are various colors and the individual must state the name of the color rather than reading the word. Individuals should take longer to name colors when presented with words that are considered threatening, in this case pain words (Crombez, Hermans, & Andriaensen, 2000). The basic premise is that the more pain is viewed as threatening to the self, the longer the subject will look at the word (because that information is relevant to their self and life) and the longer it will take to disconnect from the word in order to name the color. The dot-probe task assesses selective attention (the amount of time required for participants to change focus after being presented information that is salient to them, i.e. a pain-related stimulus) by measuring response times. Individuals are presented with a “fixation point” in the center of a screen, followed by two words (one above and one below the point). One word is a pain word and the other is another type of word. One of the words is then replaced by a letter in the same location on the screen as that word. Participants are prompted to press that letter on the keyboard as quickly as possible. The basic premise is that people with chronic pain will have faster responses when the letter is in the same location as the pain word because they will have been attending to that location to a greater extent because of the relevance of the word. Therefore, it should take longer to respond when the letter is presented in a different location from the pain word because the subject will have to disengage their attention from that spot (Dehghani, Sharpe, & Nicholas, 2003). The duration of time that is needed to press the key is representative of the time required to disengage from the stimulus that is meaningful to the individual. There are two different types of trials on the dot-probe task: congruent and incongruent.

When the replacement letter appears in the same location as the pain word, this is said to be a *congruent* trial. When the replacement letter appears in the same location as the comparison word, it is an *incongruent* trial. On congruent trials, faster response times indicate a bias toward the pain-related stimuli; on incongruent trials *slower* response times indicate bias as they represent a difficulty disengaging from the other (pain-related) stimulus.

In the past decade a fair amount of work has been conducted using these two tools. There is ample evidence that individuals with chronic pain exhibit bias toward pain-related stimuli when assessed by either of these. In my recent review of the literature, 37.5% of studies that used the Stroop and 81.8% of studies with the dot-probe found significant biases compared to controls when processing pain-related information (Steiner, 2011). It is tempting to interpret the evidence for difficulty disengaging from pain-related information as a *sign* of schema-enmeshment as it seems to represent selective attention to information that is consistent with either oneself or a major aspect of one's life. However, it does not necessarily imply that an individual with a great amount of bias toward pain-related information is in fact experiencing an enmeshment of their pain-schema and self-schema. It is possible that these individuals attend to this information and recognize pain as part of their self and their life, but they may not feel that it defines who they are or their course in life. Thus, bias as determined by these tools may serve as an indicator of possible enmeshment (or risk for enmeshment), but they are assessing a distinctly different (albeit related) construct.

A different tool for measuring enmeshment is the Pictorial Representation of Illness and Self Measure (PRISM; Buchi, Villiger, Kauer, Klaghofer, Sensky, & Stoll, 2000). This is an interactive task which provides a visual representation of how individuals view themselves in relation to their illness/pain. The task includes the use of two disks, labeled “self” and “illness”. Participants are asked to arrange the disks as they conceptualize their own experience with illness (see Figure 2). The distance between the centers of the disks is the level of Self Illness Separation (SIS). Smaller distances are associated with greater enmeshment (Buchi et al., 2002; Denton et al., 2004). In this way respondents are able to depict the magnitude of the impact of their illness on their identity.

The PRISM was used as a measure of schema-enmeshment in a sample of women with Systemic Lupus Erythmatosus (SLE) a chronic autoimmune disease associated with pain (Denton et al., 2004). In this study, SIS was correlated with recall bias toward pain-related words. As stated previously, recall of information is thought to be stronger when information is associated with one’s self in some meaningful way, and the PRISM explicitly addresses variables in relation to the self. The correlation between the PRISM and bias may imply that both measures are tapping into a similar yet still distinct construct that centers around the association between self and pain. Furthermore, the authors of this work suggested that the PRISM is a viable option for assessing schema-enmeshment because of its relationship with cognitive bias measures such as recall, which played an important role in the development of the original SEMP model (Denton et al., 2004).

Other studies have used the PRISM to assess the impact of illness or suffering because of illness in various populations, which was the original goal for the instrument by its developers (Buchi et al., 2000). A recent study evaluated the utility of the PRISM to assess burden of pain experienced by individuals with chronic pain (Kassardjian, Gardner-Nix, Dupak, Barbati, & Lam-McCollock, 2008). Several measures were compared to the PRISM to assess convergent validity of the scale and correlations with a well-validated measure of quality of life (the SF-36), such that pain disks placed further away from the self (high SIS) were associated with higher scores on the SF-36 and greater quality of life (Kassardjian et al., 2008). Correlations in this study ranged from r = 0.24-0.46. Similar correlations have been found with other samples of chronic pain and illness (Buchi et al., 2000; Buchi et al., 2002; Muhleisen, Buchi, Schmidhauser, Jenewein, French, & Hofbauer, 2009). Content validity has been evaluated as well, and when respondents were queried, the extent to which pain was an important part of their image was a consistent theme in determining placement of the pain disk (Kassadjian et al., 2008). Based on this work, there is support for the PRISM as a measure that in part addresses impact of illness on quality of life and the relationship of this impact to self. Importantly, the research on the PRISM suggests that it does assess a unique construct, the experience of self-enmeshment. The correlations with other constructs that are assumed to play a role in the development and maintenance of schema-enmeshment are encouraging and provided a basis for the validity of the measure. It is expected that constructs that are related would have some level of association with each other; however if the PRISM were just another measure of suffering or burden then correlations would be much higher. Thus it can be said that the PRISM is measuring a construct that is closely *related* to suffering, burden of illness and quality of life but is also distinct; e.g. schema-enmeshment.

Advantages of Using the PRISM

There is a fair amount of evidence to support the psychometric properties of the PRISM, especially in regard to construct and content validity. However, if the PRISM is assessing similar constructs as pre-existing measures of cognitive bias toward pain information, then why not use said measures? What does the PRISM offer? First, the PRISM offers a unique way to directly assess the extent to which pain (or illness or another symptom) is a defining feature of one's self. Cognitive bias measures may demonstrate how closely these constructs are linked in the brain, but they do not necessarily measure the emotional impact of this cognitive relationship; nor do these measures demonstrate that presence of biases (or cognitive relationships between self and pain) indicate that pain is a defining feature of one's self. At best, measures of cognitive processing may be a sign that schema-enmeshment is present, but they do not assess enmeshment directly. Likewise, self-report measures of quality of life may provide some indication of the impact of illness but often the focus is on functional impact rather than feelings about oneself. The PRISM possesses several procedural advantages to measures of cognitive bias and self-report measures. Although cognitive bias measures are useful in research, these measures are time-consuming and expensive, characteristics which makes them challenging to use in clinical practice (Steiner, 2011). Self-report measures, although less expensive, can still take time to complete and score. The PRISM can be completed usually in less than 3 minutes (Buchi et al., 2000) and is well understood by respondents (Buchi et al., 2002; Denton et al., 2004; Kassardjian et al., 2008; Steiner, 2009). Also important, the PRISM may be especially appropriate in clinical settings and intervention research since the measure facilitates discussion between the individual and the therapist about the consequences of the illness.

Additionally, the PRISM has demonstrated good test-retest reliability over a 24 hour period of time with a sample of chronic pain patients, $r = .980$, $p < 0.001$ (Kassardjian et al., 2008). A high level of test-retest reliability such as this makes the PRISM a good candidate for use in intervention research as this meets the necessary requirement to potentially be sensitive to change over time. The same is true for use of the PRISM in clinical settings as a measure of improvement or change during therapy. Research with other chronic medical conditions has found that the PRISM is sensitive to change (Muhleisen et al., 2009; Wouters et al., 2008). Wouters and colleagues found significant changes in the PRISM following a multidisciplinary intervention for whiplash and attributed changes in schema-enmeshment to the intervention. Similarly, Muhleisen et al. (2009) found the PRISM to detect large changes in dermatology patients during of an extended hospitalization period. Although this is not the same as traditional intervention period, it does demonstrate that self schema-enmeshment with illness can change over the course of time and that PRISM is capable of detecting these differences. It is for these reasons that the PRISM should be considered an acceptable measure for use with people who have chronic pain or illness, and was used in the present study.

Previous Research on Enmeshment in FMS

To my knowledge, I have conducted the only study to examine the degree of enmeshment between self and pain *and* between self and illness in a sample of women with FMS (Steiner, 2009). In this study the association between self and aspects of FMS (pain and illness) was assessed using both the Implicit Association Test (IAT) and the PRISM. The IAT is a computer task that is used to determine the association between two constructs without measuring them in an explicit manner. The test is designed to circumvent issues associated with self-report (such as social desirability) by assessing implicit attitudes about the constructs. At the time this study was conducted, only one other study had used this test to assess the relationship between self and pain in a sample of chronic pain patients (Grumm, Erbe, von Collani, & Nestler, 2008). Interestingly, the IAT demonstrated greater association between self and *illness* compared to the association between self and *pain* (Steiner, 2009). This was not consistent with the original hypotheses, possibly indicating that the participants in this sample were more enmeshed with the concept of having a chronic illness (e.g. FMS) rather than pain. An alternative explanation for these findings is that for some of the women in this sample, pain was not the most salient aspect of their experience with FMS and so they responded to illness words as a proxy for the specific symptoms that were salient to them (or the symptom that they were enmeshed with). This is a possible explanation as the stimulus words used to depict health on the IAT would be difficult to associate with oneself in the presence of *any* symptoms of illness; thus creating a stronger association between self and illness. For example, perhaps fatigue was the symptom that was most salient to the individual. The Pain IAT did not include any stimulus words that would correspond with the symptom of fatigue; however, on the Illness IAT words such as energy were used to describe “health,” thus a woman with fatigue would not associate herself with the “health” category. Thus it is possible that women with various symptoms other than pain earned scores on the IAT that were indicative of a closer relationship between self and illness because of the lack of stimuli to assess their specific personal symptoms. For this reason, it is important that the association between self and other symptoms associated with FMS be explored, as was done in the study presented here.

The previous study detected a subgroup of participants with a high degree of enmeshment of pain and self, when assessed by the PRISM (Steiner, 2009); 23.5% of the sample put the pain disk on top of the self-disk, thereby showing complete enmeshment. A moderate significant correlation between the PRISM and the Constructed Meaning in Illness Scale (Fife, 1995) was found in this work and moderate correlations (r = 0.38-0.56) were observed between individual items referring to impact of pain on self and the PRISM (Steiner, 2009). The results of this study are consistent with previous finding regarding the construct validity of the PRISM as a measure of schema-enmeshment and support its use with individuals with FMS. Based on the findings, I concluded that enmeshment or an association between self and illness was present to varying degrees in women with FMS. This initial study provided support for the feasibility of using the PRISM to assess schema-enmeshment in women with FMS. This study only examined schema-enmeshment with pain and illness. An interesting finding was that there was a greater association between self and illness compared to self and pain when assessed by the IAT. This finding prompted an interest in examining schema-enmeshment with FMS as a whole construct as well as enmeshment with the individual symptoms of the condition. The current study aimed to address this question using the PRISM.

To date only one other published study has used the PRISM with people who have FMS. In this validation study, the FMS group was a subset of a larger sample, and no analyses were conducted with regard to the FMS group in isolation (Kassardjian et al., 2008); however there were no indications that this group responded differently than the other sub-groups of the sample. Because enmeshment reflects a change in self-concept and is thought to be associated with psychological distress, interventions that aim to reduce the connection between self and the source of suffering should be explored.

Acceptance-Based Interventions for Pain and Illness

Acceptance of chronic pain and illness has been a growing area of interest over the past 15 years. Acceptance has been defined as “acknowledging that one has pain, giving up unproductive attempts to control pain, acting as if pain does not necessarily imply disability, and being able to commit one’s efforts toward living a satisfying life” (McCracken, 1998, p. 22). Acceptance does not mean that one gives in to the pain and simply decides to live a less than ideal life; acceptance implies that one is able to move on with life and live *with* the chronic pain or illness while still being aware that the condition may not dissipate. The purpose is to live in a more goal-directed manner in an effort to improve one’s overall quality of life. Greater acceptance of pain has been related to less depression, less anxiety, and less physical and psychosocial disability (McCracken, 1998). Additionally, acceptance of pain has been shown to be a unique predictor of mental well-being in individuals with chronic pain. Acceptance has a significant positive effect on mental well-being even when controlling for the effects of pain, catastrophizing and pain severity (Viane et al., 2003). Through acceptance it is believed that individuals come to think differently about their relationship with their pain, i.e. their self-enmeshment with pain.

Acceptance and Commitment Therapy

Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 1999) is considered to be part of a new generation of therapeutic interventions often called the "third wave". The interventions in this third wave share many of the same components as more traditional cognitive-behavioral approaches; however in theory these interventions place emphasis on changing people's relationship to their thoughts rather than the actual content of the thought (Segal, Teasdale, & Williams, 2004). For individuals who face situations that are relatively chronic and stable, traditional CBT methods such as gathering evidence against the validity of thought may not be beneficial. For example, people who have lived with chronic pain for years may think pain is permanent. People in this situation may think they are no longer who they were prior to pain. Examining evidence against these thoughts may prove difficult as there is a great deal of truth to them. Additionally, even if an alternative thought can be created it may be that the person does not really believe in the new thought. Continued pain experiences will serve to reinforce the original negative thoughts about pain and their self in relation to pain. This reinforcement may occur in part through self-observation of these experiences which then become incorporated into one's self-schema. ACT may provide another way to address this issue. Instead of attempting to dispute the validity of the thought, ACT emphasizes working to change how one is connected to the thought and how to move forward.

The ACT Framework

ACT is grounded in two theories: functional contextualism (Bigland & Hayes, 1996; Hayes, 1993; Hayes & Brownstein, 1986) and relational frame theory (RFT;

Hayes, Barnes-Holmes, & Roche, 2001). According to the view of functional contextualism, psychological processes and events, such as thoughts, are integral parts of the whole organism; these processes do not occur in isolation and they interact with the context that they take place within (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Instead of just changing the thought, the entire context and environment that created and enforced the thought could be changed. RFT suggests that language and cognition are at the root of how people form relations and connections between constructs in the mind (Hayes et al., 2006). According to Hayes and colleagues (2006), the way that language interacts with context is the cause of distress and/or psychopathology. In individuals with chronic pain, who may have developed a belief that they are no longer a useful person, this is not just a thought that can be altered, this is a part of who they are and how they exist in the context of being a person with chronic pain. The ACT and RFT framework would suggest that through context and experience “I” and “chronic pain patient” have become fused in the mind and this in turn contributes to behaviors that are consistent with that relationship.

The ACT model has six core components that are key to understanding people’s relationship with their thoughts. *Cognitive fusion* is a critical component in this model. Hayes et al. (1999) defines cognitive fusion as “excessive or improper regulation of behavior by verbal processes, such as rules as derived networks”. Behavior is guided by the inflexibility of the network and by reinforcers in the environment. Individuals start to behave in a way that is congruent with their thoughts about themselves, which perpetuates the cycle. The thought or relationship between ideas becomes truth. This is actually very similar to the way we understand enmeshment; schema-enmeshment occurs when the problem (in this case chronic pain and illness) and the associated behavioral changes start to define the person. As the person continues to engage in behaviors that are schema-consistent, this will further reinforce the belief that they are their illness. For example, an FMS sufferer may start to experience symptoms and as a result may start to limit her physical activity, or a member of her family may encourage her to do so in order to prevent further pain. As she continues to avoid physical activities or obligations, she could potentially start to view herself as a “fibro patient” rather than a person with FMS. Once this labeling has occurred, every time she confronts a situation that may be challenging she may have the thought “I cannot do that because I’m a fibro patient.” The language/label/thought guides her future experiences and leads to a strong association between her personal identity and her illness. The ACT perspective would identify this experience as cognitive fusion.

Another integral part of ACT is an emphasis on *contact with the present moment*. Clients are encouraged to focus on the present rather than dwelling on past selves or lost possible future selves, which could in turn reinforce the relationship between their current self and pain (Hayes et al., 2006). A third component is known as *self as context*. This idea refers to the fact that self serves as a foundation for which relationships in the mind are formed, and so most information is attached to our definition of self in some way. In ACT, clients are taught to have experiences without forming inflexible attachments to their sense of self. For example, a person could experience a particularly painful day but that does not mean that they *are* their pain. *Acceptance* is another key process; this process involves becoming capable of acknowledging events that are part of one’s personal history (such as having chronic pain) without attempting to change the event, especially when doing so may be futile and lead to distress (Hayes et al., 2006). This is especially relevant for individuals with pain or chronic illness as attempts to control the physical symptoms could be never-ending, thus becoming a major component of one's life and identity.

The other two components of ACT are considered ways to foster acceptance and cognitive *defusion*. *Defusion* is an ACT-specific word that refers to the process of separating the emotional connection to a thought and the thought itself. In pain-specific ACT, defusion would involve creating cognitive distance from deeply held beliefs about self and pain. For example, if a person believes that "I am my fibromyalgia", the separation of the individual from the actual experience of FMS is what is known as defusion. In many ways, this could be thought of as an opponent process to schema-enmeshment. *Values* and *committed action* refer to encouraging the client to work toward their personal goals and live a life that is aligned with their values rather than living focused on what is preventing them from reaching said values. According to the model, all six processes are inter-related and serve to reinforce one another; through these components psychological flexibility may be achieved (see Hexaflex; Figure 3) which may help a person to become less entrenched in their pain.

Relationship to the SEMP

Many of the components of ACT map onto the ideas associated with the SEMP. Cognitive fusion seems to be closely related in theory to schema-enmeshment. The common theme is that individuals have a sense of self that serves as a starting point from which relationships with other concepts are formed. In both cognitive fusion and schema-enmeshment, the self becomes associated with a thought or construct which is not useful and becomes the framework for thoughts about the self and the world. These constructs appear to be remarkably similar, possibly even referring to the same process by different names. If ACT is capable of breaking this fusion, then perhaps it is a viable candidate for treating pain and self schema-enmeshment.

Additionally, the ACT intention to focus on present may be an especially appropriate approach for individuals who are enmeshed with their illness or its symptoms. This enmeshment signals a preoccupation with mourning for lost selves (past or future). Individuals who have adopted a self that is enmeshed with pain are limiting themselves on a daily basis on what they can or cannot achieve. Rather, ACT encourages a focus on the present as a “jumping off point” to building a life that is more consistent with one’s desires, goals, and values. ACT strongly emphasizes the importance of behavior, specifically ACTion, and how actions should move one in the direction of what is important to them rather than being guided by pain or maladaptive thinking (Hayes, Strosahl, & Wilson, 2012). This may help individuals begin to see themselves differently as they move away from the control of the illness or a life that is completely dominated by pain and illness.

Empirical Support for Acceptance-Based Interventions

Several studies have been conducted with various medical populations to test the efficacy of Acceptance-based interventions (ABI) for chronic pain and illness. McCracken and Eccelston (2005) measured acceptance and several facets of patient functioning at baseline and again approximately 2-6 months later in 118 inpatient chronic pain patients. Greater levels of acceptance at baseline were predictive of better patient functioning in emotional, social, and physical domains at the later assessments. A fairly recent study (Vowels & McCracken, 2008) evaluated the effect of an intensive ABI on 171 inpatient individuals with chronic pain. The intervention consisted of methods from ACT and mindfulness based approaches. Results of this work demonstrated statistically significant improvements in pain, depression, physical functioning, pain-related anxiety, work status, and frequency of medical visits (Vowels & McCracken, 2008). Perhaps most importantly, large reductions in unemployment were seen in this sample with the percentage of individuals working increasing by approximately 10% from baseline to 3 month follow-up. This finding is especially relevant as it may indicate a willingness to continue living in pursuit of a more active life rather than succumbing to the physical pain. Of note, there was no control group in this study, thus comparisons are across time within a single group. Similar results have been found for other samples of patients undergoing acceptance-based therapy for chronic pain by the same research team (McCracken, Vowles, & Eccelston, 2005, McCracken & Eccelston, 2005).

In addition to single cohort studies, a few randomized controlled trials of ABI have been conducted and have yielded encouraging findings. Dahl and colleagues (2004) conducted an RCT comparing ACT for chronic pain to treatment as usual, with the goal of reducing sick days taken from work and use of medical resources. Specifically, the authors stated that the goal of the intervention was not to reduce physical symptoms or stress that could exacerbate symptoms, but to change the way that individuals relate to the stress and pain (Dahl et al., 2004). After treatment, individuals in the ACT condition had significantly fewer sick days compared to the treatment as usual group (M = 1 day, M = 11.5 days, respectively). These differences were even greater at 6 month follow-up. The number of medical visits also decreased for the ACT group and these reductions were maintained at follow-up. What is interesting about this particular study is that following the intervention period, there were no differences between groups in stress or pain, and stress and pain did *not* improve as a result of the intervention. Similar results were found by Wicksell and colleagues (2008) such that the group that received acceptance-based therapy displayed significant improvements in depression, pain disability and life satisfaction. These improvements were greater than those observed in the control group; however no changes in pain intensity were observed in either treatment condition. This is especially meaningful as individuals in the ACT condition had marked reductions in sick days, medical utilization (Dahl et al., 2004), disability, and psychological distress (Wicksell et al., 2008) despite still experiencing similar levels of pain and stress. Dahl et al., 2004 concluded that these results were due to a change in the way that individuals approached their illness, so that it was no longer controlling their lives.

Despite the new interest in acceptance as an important predictor of overall functioning in pain patients, no studies to date have examined the role of acceptance in relation to schema-enmeshment. Given the core tenets of ACT, it seems to be an especially appropriate type of intervention to target schema-enmeshment. Furthermore, it is important to try to understand how acceptance may contribute to changes in schema-enmeshment. According to ACT principles, change is produced by fostering an attitude of acceptance (Hayes et al., 2012) and it is assumed that acceptance is one of the fundamental mechanisms of action in this type of psychotherapy, however the exact role of acceptance in predicting change in any outcome (not just schema-enmeshment) has not been determined (Arch & Craske, 2010). ACT specifically targets behavior, rather than changes in thoughts or emotions; however change in the way that one *relates* to thoughts and emotions is consistent with ACT ideals (Hayes et al., 2012). Specifically, ACT includes exercises to encourage learning to relinquish maladaptive attempts to control pain and instead engage in meaningful life activities even in the presence of pain [pain acceptance], which according to theory should be related to a changes in the way that one relates to their thoughts about pain and their self (Hayes et al., 2012). One way in which pain acceptance may be predictive of changes in thoughts about self lies in self-perception theory (Bem, 1972). The basic premise of this theory is that we observe our own behavior to infer how we feel about situations and ourselves (Bem, 1972; Wilson & Dunn, 2004). The simplest example may be someone notices that they are always going out of their way to help others; they may conclude that they are a helpful person. In the context of ACT for chronic pain, an individual may notice that they are able to work, spend time with their family, or do other activities that they find important and thus they may observe this behavior and think “I am a complete person even though I have pain”. It is possible that the acceptance, when it leads to engagement in core life values, works in this way to undermine schema-enmeshment of self with FMS. Although pain acceptance is comprised of both a behavioral aspect (activity engagement) and a willingness to experience pain without control attempts (pain willingness), this suggests that the behavioral aspect is the specific component of acceptance that leads to changes in thoughts. A pure focus on activity engagement as a potential mechanism of action or mediator of change would be consistent with self-perception theory (Bem, 1972) as individuals look to their behavior to make inferences; this would also being in alignment with the idea of ACT as a behavior-focused therapy. However, it is possible that pain willingness could still play a role as individuals may interpret their choosing to refrain from engagement in control behaviors as the action that is reflected upon. Therefore, I examined both subscales separately as they are considered to be distinct but related aspects of pain acceptance, and the unique roles of activity engagement and pain willingness in relation to schema-enmeshment, or changes in self related thoughts are unknown.

Research Questions and Hypotheses

The present study tested an 8 week randomized controlled ACT intervention for patients with FMS. I hypothesized that compared to an education control, ACT will lead to reductions in schema-enmeshment. I also hypothesized that ACT will increase acceptance of pain since previous intervention studies have demonstrated this. Lastly, I hypothesized that changes in acceptance of pain (specifically activity engagement) would lead to changes in schema-enmeshment of self with FMS symptoms, and that this would mediate a potential relationship between treatment group and changes in enmeshment post-intervention. Specifically if individuals develop greater acceptance of their pain, they may be able to view pain as something that does not control them or dictate their self worth, and they will not let their self be determined by their symptoms.

Hypothesis 1

Research Question 1: Does receiving ACT lead to reductions in enmeshment?

Hypothesis 1: *There will be a significant difference between the ACT group and education group in post-intervention enmeshment as measured by the PRISM, when controlling for baseline enmeshment. If this difference is significant, means will reflect greater reductions in enmeshment for those in the ACT group.*

Hypothesis 2

Research Question 2: Does receiving ACT lead to increases in acceptance?

Hypothesis 2: *There will be a significant difference between the ACT group and education group in post-intervention acceptance of pain as measured by the CPAQ, when controlling for baseline acceptance. If this difference is significant, means will reflect greater increases in acceptance for those in the ACT group.*

Hypothesis 3

Research Question 3: Does acceptance of pain mediate the relationship between group membership and changes in schema-enmeshment as self-perception theory may suggest?

Hypothesis 3a: *Activity engagement (acceptance of pain will mediate the relationship between group membership and change in schema-enmeshment* (see Figure 4).

Hypothesis 3b: *Pain willingness (acceptance of pain) will mediate the relationship between group membership and change in schema-enmeshment.*

METHOD

Design

The present study used data collected from a larger-scale pilot RCT of Acceptance and Commitment Therapy for FMS. In the RCT participants were randomly assigned to receive ACT or FMS/pain management education. Randomization took place through a "coin-flip" method in order to assure true randomization in which each prospective participant had an equal chance of being assigned to each group. Although this method does not ensure equal sample size across treatment conditions, it is a more reliable way compared to blocking methods to establish an equal distribution of demographic and clinical characteristics; furthermore, this method is supported as a superior way to establish true randomness compared to blocking approaches (Schultz & Grimes, 2002). Once randomized, participants completed approximately 8 one-on-one sessions with the interventionist or the educator. Sessions occurred once a week for 1 hour at a time. Within the ACT arm of the study the number of sessions was flexible. If both the participant and the interventionist determined that the goals of the intervention had been achieved by week 6, the last two planned meetings were cancelled. If they determined that more sessions were needed past the 8 weeks, two additional sessions were scheduled. No participant (except those who dropped out of the program) had less than 6 or more than 10 sessions. The reason for making the duration of the intervention period flexible was to make the intervention consistent with ACT principles. This was not viewed as a threat to the standardization of the study as the goal was to assist each participant in reaching their full-potential that they can gain from the intervention (whether that potential is realized in 6 sessions or in 10). Recently, there has been a movement toward adaptive treatment strategies for interventions with predetermined “choice points” for determining the next action in the intervention (Murphy, 2005). Furthermore, the number of sessions completed was controlled for in all relevant analyses.

The manualized ACT intervention included the following components: (a) assessment, conceptualization, rationale, and rapport; (b) willingness to contact unwanted emotion; (c) introduction to cognitive defusion; (d) introduction to values and value clarification; introduction to committed action; (e) willingness, mindfulness, present moment, and defusion; (f) further establishing values; (g) committed action; (h) self as context and committed action. The ACT intervention was based on a manual entitled *Living Beyond Your Pain: Using Acceptance and Commitment Therapy to Ease Chronic* Pain (Dahl & Lundgren, 2006). Although a suggested order of intervention components was provided, it should be noted that ACT is often less sequential than other interventions. This is because the various ACT components are simultaneously present more or less in all sessions and largely dependent on one another (e.g., patients are taught to *accept* their painful experiences, when and if controlling/avoiding these events are interfering with his/her *values*). As such, flexibility in presentation order and time spent on components was built into the protocol and to the discretion of the interventionist and the supervising clinician.

Despite the relative flexibility in the order of presented topics within the ACT protocol, the exercises within each topic were standardized. Participants were taught that previous attempts to control, avoid, or manage pain were ultimately futile as pain is chronic in nature; this shift in thinking was fostered through a process known as creative hopelessness which is integral to ACT. Participants were encouraged to explore their personal values (and the ways in which control strategies interfere with said values) through completing the Valued Living Questionnaire (Dahl & Ludgren, 2006, pg. 45). Participants were taught mindfulness techniques in order to practice experiencing thoughts, emotions, and physical sensation related to pain and FMS without becoming fixated on these experiences. Mindfulness exercises such as *being in the moment* (Dahl & Lundgren, 2006, pg. 99) in which the individual practices experiencing pain and associated thoughts without judgment were included in each session. Furthermore, participants in the ACT group were asked to practice mindfulness on a daily basis as homework. Defusion techniques such as *the arrogance of words, this is me thinking,* and *kicking your buts* (Dahl & Lundgren, 2006, pg. 75, 78, and 80 respectively) were used to demonstrate separating one's self from one's thoughts. Likewise, self-as-content exercises such *the observer self* and *the chessboard metaphor* (Dahl & Lundgren, 2006, pg. 89 and 91 respectively) were introduced to demonstrate that the individual is greater than their pain. All of the aforementioned exercises are variations of classic ACT techniques; a detailed description of each is available in the manual as well as Hayes et al. (2012). This intervention focused heavily on encouraging participants to commit to behaviors that would reflect their stated life values (committed action). Participants were assigned a "committed action" as homework every week. It is important to note that participants were instructed to complete these behaviors even in the presence of pain or discomfort. Worksheets pertaining to each topic were also assigned as homework.

The Fibromyalgia/Pain Management intervention consisted of education on the following topics: a) overview of FMS; b) pain; c) fatigue; d) mood; e) sleep; f) stress; g), nutrition; h) living well with FMS. This manualized education control intervention was adapted from a manual (Oliver, Cronan, Walen, & Tomita, 2001) that has successfully been used in other RCTs with FMS patients (Ang et al., 2011). Participants in the education intervention were provided with a written copy of the educational material at each session; the participant and interventionist discussed the material together. Information was provided in a conversational manner and the interventionist asked standardized questions to elicit the participants' thoughts, feelings, and reactions related to the material. Participants were encouraged to relate the material to their own experience and to share this with the interventionist. Interventionists did not actively encourage participants to adjust their behavior based on the information provided. Participants in the education group did not receive homework assignments.

Data from the initial screening, baseline, and post-intervention assessments was used to evaluate the hypotheses presented above. The analyses for this study were prospective and longitudinal. A detailed data analysis plan is outlined in subsequent sections.

Recruitment

Participants in this study were women diagnosed with FMS (N = 28). Recruitment took place through a variety of methods including flyers, doctor referrals,

referrals from the IU Clinical Research Center for Fibromyalgia-Pain (IUCRCF-P), newspaper advertisements, and a general Rheumatology recruitment database. Flyers were placed in doctor's offices, pain clinics, and various public locations across the Indianapolis metropolitan area. An advertisement on the IU research website was also posted. Participants from previous studies conducted by the IUCRCF-P served as participants for the proposed study as well. Potential participants from the recruitment database or physician/center referral were contacted via telephone call and asked to participate in the proposed study. Volunteers interested in the study after receiving a flyer contacted the study manager (myself) via telephone or email.

During the initial contact, I briefly described the study purpose and the commitment required from the participant (see Appendix A). If the individual was interested in participation, she was asked to complete a brief 10-15 minute questionnaire to determine eligibility for the study. This could be completed on the telephone, or online through the secure data capture system (REDCAP). I hand scored the questionnaire. Once eligibility was determined, participants were contacted via their method of choice (telephone or email) and notified of their eligibility status. Those individuals who were deemed eligible continued on to complete an online informed consent statement and participate in the rest of the study procedures.

A large recruitment source was a database which consisted of women who had either participated in past studies or expressed general interest in participating in research studies. This recruitment database was compiled by the IUCRCF-P. In addition to recruitment through the database, other mediums such as flyers, physician referral, and referrals from the IUCRCF-P were utilized. However it should be noted that these methods overlapped with the recruitment database and no additional potential participants were identified through these methods. Phone calls were made from this database (and return calls were made to those who expressed interest on their own, resulting in contact with 77 women directly (of approximately 435 attempts). Of the 77 with whom I had direct contact, 56 agreed to be assessed for eligibility to participate in the study. Women who were spoken to directly on the phone, refused the study because of several reasons: 10 reported they were doing well and were not interested in any other treatment options at this time, 4 because of inability to commit to a study that included so many visits, 4 refused because of lack of time/too many other commitments, and 3 did not have travel accommodations. From this group 37 women met criteria and of these, 4 decided not to participate after screening, resulting in a total sample size of 33 women who provided consent to participate in the study (recruitment detail provided in Figure 5).

Participants were randomized into one of two conditions; ACT or educational control. Randomization appeared to be effective (ACT N = 18; Ed N = 15); however attrition over the course of the study resulted in uneven group sizes at post-intervention (ACT N = 15, Ed N = 9; see CONSORT chart Figure 5). A total of 28 participants completed the baseline assessment and 24 completed the post-intervention assessment. Estimated power for an ANCOVA based on this sample size was 0.53 (G-power). Actual observed power ranged from 0.51- 0.78.

Eligibility Criteria

The following inclusion criteria had to be satisfied to participate in the study: 1) diagnosed with FMS by physician, 2) score at 40 or above on the Fibromyalgia Impact

Questionnaire; this is a cut-off score that has been used in other trials with FMS patients (Ang et al., 2011) to guarantee that the FMS is impacting the ability of individuals to perform activities of daily living, 3) age between 18-65 years, 4) ability to attend 1-hour weekly sessions for 8 weeks and to engage in required home practice, 5) willingness to be randomized into two different intervention groups, 6) on stable doses of the following medications for at least 4 weeks: cyclobenzaprine, tramadol, gabapentin, pregabalin, tricyclics, selective serotonin reuptake inhibitor (SSRI) and selective norepinephrine serotonin reuptake inhibitor (SNRI), or a willingness to keep her medication regimen (whatever it is) stable for the duration or the study, and 7) able to read, speak and write in English.

Exclusion criteria were as follows:1) active suicidal intention or plan, 2) other major rheumatic conditions, 3) schizophrenia or other psychosis (self-report and clinician assessment), 4) evidence of a possible Axis II disorder as assessed by the IOWA PD screener, and 5) dementia, neuropsychological problems, or cognitive impairment (self-report and clinician assessment). The decision to exclude individuals with possible Axis II disorders was made in an attempt to control for factors that may interfere with evaluating the efficacy of the intervention in the larger scale study, of which the proposed research is a component.

Procedure

Once participants passed the eligibility screener they were randomly assigned to either the ACT or Education control group. Participants were then contacted to schedule the intervention sessions. They were not notified of their group assignment until after online signature of the informed consent statement, completion of the first questionnaire, and scheduling of the first intervention session (with either the ACT therapist or the educator). Participants were scheduled to attend 8 sessions of the intervention. After successful completion of the intervention, participants completed a second questionnaire to assess the effects of the intervention (see Figure 6).

Measures

Demographics and Background Questionnaire

The background information and demographics questionnaire included items regarding age, ethnicity, marital status, level of education, years since diagnosis, disability status, and any FMS related medications.

IOWA Personality Disorder Screen

The IOWA personality Disorder Screen is an 11item self-report measure. The screen is intended to establish the presence of an Axis II disorder (personality disorder). Validation studies have shown that the screen is effective for diagnosing the presence of personality disorders, although the ability to distinguish between categories of personality disorders is lacking (Langbehn et al., 1999). For the purposes of this study it was not necessary to identify a particular Axis II disorder, only the presence of a disorder so as to determine if the participant met inclusion criteria.

Brief fatigue inventory (BFI)

The BFI (Mendoza et al., 1999) is a self-report measure consisting of three items that require the participant to rate their level of fatigue on a scale from 0-10, with 0 = “no fatigue” and 10 = “fatigue as bad as you can imagine.” Participants then rate how their fatigue has impacted multiple life domains including general activity and enjoyment of life. These domains are rated based on interference due to fatigue on a scale from 0-10, with 0 = “does not interfere” and 10 = “completely interferes.” (see Appendix B).

Outcome Measures

Pictorial Representation of Illness and Self Measure (PRISM)

The PRISM is an interactive measure of self and illness/pain enmeshment that provides a visual representation of how individuals view themselves in relation to their illness/pain. The task includes the use of two disks, labeled “self” and “illness”. Participants are asked to arrange the disks as they conceptualize their own experience with illness (see Figure 2; Appendix C). The distance between the centers of the disks is the level of Self Illness Separation (SIS). Smaller distances are associated with greater enmeshment (Buchi et al., 2002; Denton et al., 2004). As stated previously, the PRISM has demonstrated adequate convergent validity with other related measures of quality of life and impact of illness (Buchi et al., 2000; Buchi et al., 2002; Kassadjian et al., 2008; Muhleisen et al., 2009). Content validity and adequate test-retest reliability of the measure is also well supported (Kassadjian et al., 2008). In the present study the PRISM was used to assess self schema-enmeshment with FMS, pain, fatigue, and cognitive symptoms such as trouble remembering things, difficulty concentrating, and feeling as if one was walking around in a haze. Patients often refer to this experience as “fibrofog” and this term was used when administering the PRISM.

Fibromyalgia Impact Questionnaire (FIQ)

The FIQ is a self-report measure designed to assess the effect of FMS on various aspects of functioning, including the ability to execute certain tasks and ratings of pain levels (Burckhardt, Clark, & Bennett, 1991). The measure consists of 10 tasks that participants must rate according to their ability to execute on a scale of 0-3, with 0 representing “always” and 3 being “never”. The measure also includes two visual analogue scales, and several items which ask the participant to mark a point along a continuum. For example an item may read “How bad has your pain been?” In this case the participant would indicate the intensity of the pain by making a mark on a visual analogue scale ranging from “no pain” to “very severe pain” (see Appendix D). The measure is scored such that the first 10 items are averaged to create a physical impairment subscale which ranges from 0-3 with greater scores indicating greater impairment. This subscale score is then added to the responses from the other items to create a total score ranging from 0-100; higher scores indicate greater impact of FMS (see Appendix D). Additionally, one of the items on the FIQ is a visual analogue scale of pain severity over the past week. The measure has demonstrated adequate discriminant validity when administered to individuals with other pain disorders, such that people with FMS have higher scores on the FIQ compared people with other conditions (Bennett, 2005). Additionally, a study by White and colleagues (1999) compared the FIQ with 8 other measures of distress and dysfunction and found that the FIQ better predicted self-reported function than any of the other measures. The FIQ has been used in over 100 studies with FMS patients (Bennett, 2005) and is considered the gold-standard for assessing impact of FMS on patients.

Mediator Measures

Chronic Pain Acceptance Questionnaire (CPAQ)

The Chronic Pain Acceptance Questionnaire (CPAQ) is a self report measure consisting of 20 items that assess an individual's acceptance of their pain (McCracken, Vowles, & Eccelston, 2004). Each item is rated on a 6-point scale according to how much the individual feels the statement applies to them (see Appendix E). The scale ranges from 0-6 with 0 representing "never true" and 6 representing "always true". The scale is divided into two subscales, which are added together to create a total score. One subscale assesses *activity engagement* or an ability to execute physical activities despite the pain and is scored such that higher scores indicate greater engagement. It should be noted that the type of activity is not specified on the CPAQ, instead it is more generally assessed with items like *"Keeping my pain level under control takes first priority whenever I'm doing something"*. The vagueness of these items is purposeful as acceptance-based interventions are focused on what activities are important to the individual; thus it may be exercise related activities or spending time with family. The second subscale focuses on *pain willingness* or the "recognition that avoidance and control are often unworkable methods of adapting to chronic pain" (McCracken et al., 2004, pg. 161) and is scored such that higher scores indicate greater willingness to experience pain without the need to control or avoid the painful sensations. The two subscales were derived through component factor analysis and have demonstrated good internal consistency (McCracken et al., 2004); furthermore the 2-scale structure was supported by confirmatory factor analysis in 2008 (Vowels, McCracken, McLeod, & Eccelston, 2008). This scale has been used reliably in previous research on pain acceptance (Morley, Davies, & Barton, 2005).

Measures to Assess Validity of the PRISM

The Twenty Statements Test (TST)

This is a self-report measure of self-concept that has been used in hundreds of studies of self-concept (Kuhn & McPartland, 1954). This measure is displayed as a blank sheet of paper with the header: “There are twenty numbered blanks on the page below. Please write twenty answers to the simple question 'Who am I?' in the blanks. Just give twenty different answers to this question. Answer as if you were giving the answers to yourself, not to somebody else. Write the answers in the order that they occur to you” followed by twenty blank spaces (see Appendix F). Themes in responses are then evaluated by the researcher and responses that occur first are considered more salient aspects of self-concept. Test-retest reliability has been estimated as greater than $r = 0.85$, and the coefficient of reproducibility ranging from 0.89-0.90 (Kuhn & McPartland, 1954). The validity of the scale is difficult to assess because of the nature of the measure itself and the personal nature of the concept of self.

The TST was used in this study as a means of establishing convergent validity with the PRISM. If the PRISM is indeed a measure of schema-enmeshment of self and illness then it should moderately correlate with other measures of self-concept. This is important as the PRISM has been considered to be a measure of various self and illness related constructs including: burden of suffering and burden of illness to the self. Previous validation studies (Buchi et al., 2002; Kassardjian et al., 2008) of the PRISM have used verbal probing as a method of validating content and construct validity. Establishing a relationship between the TST and the PRISM would indicate that the PRISM is a measure that assesses an aspect of self and add to its construct validity. See Table 1 for a complete timetable of measures and assessment periods.

Data Collection

The majority of the data collection was completed through an online data collection system called REDCap. REDCap is a software application originally developed by Vanderbilt University that is designed to collect and manage data from research projects and clinical trials electronically. According to the developers:

> "REDCap and REDCap survey software are safe and secure web-based programs. The servers hosting REDCap and REDCap Survey are physically located in a secured and environmentally structured computer operations center on the main campus of IUPUI and are supported by Division of Biostatistics server and database administrators. To comply with HIPAA guidelines, processes and procedures have been documented and implemented to ensure the security and protection of the study and/or survey data within the computer operations center, the servers, and the databases." (Harris et al., 2009)

A few questionnaires were mailed to participants and completed by hand in hard-copy (in the case that the participant lacked internet-access or was not familiar with the computer).

The PRISM was the only measure administered in person. This was administered by the interventionist or a team member during the 1st and last session.

RESULTS

The two aims of this study were to determine if there would be significant treatment group differences in schema-enmeshment of self with several FMS related symptoms, and with acceptance of pain following 8 weeks of either ACT or psychoeducation about FMS symptom self-management. In addition, the potential role of activity engagement (a form of pain acceptance) as a mediator of the relationship between treatment group and changes in schema-enmeshment was assessed. The results of these analyses are presented in this section following a presentation of data cleaning and preparation and descriptive analyses.

Data Cleaning and Preparation

Prior to data analysis the dataset was carefully cleaned to ensure accuracy of the data. Data was imported from the REDCap data capture system into SPSS version 19. The data was then inspected visually by myself and a research assistant to ensure accuracy of the data and detect any mistakes or inappropriate missing values. Following this process, data cleaning procedures were followed.

Outliers

The dataset was inspected to make sure there are no values which were considered out-of-range for a given variable. It is important to identify outliers as statistical tests which rely on means (such as ANCOVAs) are easily impacted by values that are far outside the group norms, as one extremely high or low value can pull the entire mean in the direction of that value creating a false estimate of the mean. Outliers on all variables were identified within each group as is suggested when conducting analyses on grouped data (Tabachnik & Fidell, 1996). First, univariate outliers were identified as those that have z-scores greater than 2.57 with a p-value less than 0.01. The decision to use this cut-point was based on the recommendations of Tabachnik and Fidel (1996) as well as Cousineau and Chartier (2010). Cousineau and Chartier (2010) suggest that when a sample is small and no Bonferroni correction is used, a z-score criterion should be 2.57 to detect an effect that is significant at the 0.01 *p* level. Cousineau and Chartier (2010) also suggest that data be inspected for outliers visually, especially in the case of small sample sizes. The reason for this is that in a small sample, outliers may be missed because of limitations in how large a z-score can be as a result of limited number of cases. It is unlikely that a given value will ever be larger than the decision criterion which is directly related to the size of the sample, thus possible outliers would never be detected unless inspected visually. Visual inspection of the data was performed to remove outliers. Following both computerized and visual inspection of the data, three cases were removed because of outliers. These cases were only removed from the analyses which utilized the variable on which the case was an outlier (rather than deleting the entire case). The decision to handle outliers in this fashion was based on the small sample size; had the entire case been removed the sample size and statistical power would have been further reduced.

Missing Data

Although Tabachnik and Fidell (1996) suggest addressing missing data through imputation methods such as inserting the mean value of the group on that particular item, this is not supported by others (Cousineau & Chartier, 2010). One of the advantages of using this method of imputation is that the mean distribution of the whole remains stable and does not require one to guess, making it the most conservative method (Tabachnik & Fidell, 1996). Of course there are some drawbacks to this approach as well, such as reducing the spread of the distribution, possibly increasing risk of type I error (Cousineau & Chartier, 2010). Missing data was minimal as the online questionnaire was set up so that the participant could not move onto the next page if an item had not been answered; however in accordance with IRB every item had “choose not to answer” as an option. In this manner it was ensured that missing data is due to personal decision not to respond rather than simply missing an item in the large battery of questions. Furthermore, intent-to-treat analyses using the “last measure carried forward” method is an example of data imputation and additional imputation that would further increase risk of type 1 error. Only 4 cases were missing data on the PRISM measure, as a result of interventionist error. Because missing data was minimal, and out of concern for type 1 error, further data imputation to address missing data was not used.

Normality

It is also important to ensure normality (the extent to which the values of a given variable follow a normal distribution) as normality of data is a common assumption for most statistical tests. This is especially relevant when sample sizes are smaller (as is the case in this study) as they are less likely to naturally conform to a normal distribution. Frequencies and graphic representations of the data were examined to help determine skewness and nonlinearity; these were followed up by the Kolmogorov-Smirnov and Shapiro-Wilks tests. Levene's tests of homogeneity of variance were also conducted to ensure that there was equal variance across groups.

At baseline, the CPAQ data was normally distributed so transformation was not necessary; however the PRISM data was not normally distributed. All of the PRISM data was skewed to the right toward greater schema-enmeshment. At post-intervention, the ACT data for PRISM FMS and PRISM fatigue were right skewed; the education group data for the activity engagement was bi-modal and PRISM fatigue were right skewed. All other variables were normally distributed. Transformation of data is often recommended to ensure normality and equality of variance (Tabachnik & Fidell, 2001). In cases when transformations are performed, the analyses are typically conducted two ways (with and without the transformation) and the results are compared. If the results are different, both sets of analyses are reported. This approach to the data was considered. However, statisticians have discrepant attitudes toward the use of transformations (Meyers, Gamst, Guarino, 2006). One of the cautions of using transformations is that it can create challenges in interpreting the data as the transformed scores often look substantially different from the raw data (Meyes, Gamst, Guarino, 2006). This may be especially important when considering the way in which PRISM SIS is measured, such that 0 is a meaningful value indicating complete enmeshment. Of note, there is a high frequency of 0 scores on all of the variables assessed with the PRISM. Other researchers have recently suggested that transformation of independent variables is not appropriate when using “counts” since there are often a high number of 0 observations (Maindonald &Braun, 2007; O’Hara & Kotze, 2010). O’Hara and Kotze (2010) demonstrated that in general, transformations perform poorly when dealing with data in which there are a high number of 0 observations. Although the present study did not use counts per se, the high frequency of 0 scores on the PRISM measures could potentially cause inappropriate interpretations when data are transformed, as 0 scores cannot be transformed using a logarithmic transformation. Additionally there has recently been much concern about the hazards of overfitting datasets (Babyak, 2004) which may create a situation in which effects are detected in the sample when they may not exist within the population. The concern for overfitting of data includes processes such as searching for confounds and statistically controlling for said variables, and conducting too many screening tests (Babyak, 2004). The reason for this is that for each test, degrees of freedom are used up or “wasted” and they then become what Babyak calls “phantom degrees of freedom” which leads to increased risk of error. Thus, it was decided to avoid some of the common methods of data cleaning (transformations and adjustments for excessive multicollinearity) in an effort to make sure the dataset was not overfit to the sample characteristics, as well as to account for the high frequency of “0” observations. In spite of all of the concerns about transformation, I ran the analyses both ways (with the data transformed and with data unadjusted). Running the analyses with the transformed data did not change the pattern of findings. Thus, given that there were no differences, the reported results are with the non-transformed data to account for the initial concerns.

Statistical Analysis Plan

Analyses were conducted as intent-to-treat with the "last measure carried forward" method. This is deemed to be a relatively conservative method of data imputation as it assumes that there is no difference from the previous time of assessment.

Analyses for Hypotheses Testing

Hypothesis 1: *There will be a significant difference between the ACT group and education group in post-intervention enmeshment as measured by the PRISM, after controlling for baseline enmeshment. Means will reflect greater reductions in enmeshment for the ACT group than the control group.* This was tested using an ANCOVA to compare the means of each group on the post-intervention PRISM scores while controlling for baseline scores as the covariate. There are several reasons why I chose this approach rather than opting for repeated-measures ANOVA, an ANOVA with change scores, or a one-way ANOVA. Although many pre-post designs utilize repeated measures ANOVA, there are concerns with this approach, mainly that pretest scores are not influenced by the treatment when calculating the treatment main effect (Dimitriv & Rumrill, 2003) and so use of ANCOVA or ANOVA with change scores is advised. The main advantage to using ANCOVA is that this method helps to reduce error variance. ANCOVA can also be conducted on a much smaller sample size than ANOVA of change given that the pretest and posttest have the same amount of within-group variance (Van Breukelen, 2006). However, a potential drawback to ANCOVA is that as the difference between groups at baseline increases there is a greater likelihood of bias and greater measurement error (Van Breukelen, 2006). A potential final option would be to test this hypothesis using a one-way ANOVA. It can be argued that if groups demonstrate no significant differences at baseline, presumably due to successful randomization, then controlling for baseline is not necessary (Rausch, Maxwell, & Kelley, 2003). However, a one-way ANOVA only assesses group differences at one point in time, in this case postintervention, and does not fully account for *change* in the variable of interest over time. Furthermore, according to Huck and McLean (1975; referenced in Rausch et al., 2003) it is not advised to use this method "when pretest data is available…[because pretest data] should be used to a) adjust posttest means to account for initial differences between treatment groups and b) increase the power of the analysis by reducing within-group variability" (Huck & McLean, 1975, pg. 513). Based on all of the above reasons, ANCOVA controlling for baseline scores was deemed the most appropriate test for this hypothesis.

Additionally, because the PRISM was used to measure several different FMS related constructs (Fibromyalgia, Pain, Fatigue, and Cognitive Symptoms/"Fibrofog") a separate ANCOVA was conducted for each of these variables resulting in four separate analyses. The use of MANCOVA was considered; however ultimately it was deemed inappropriate as MANCOVA would not allow for the control of individual baseline variables; rather all baseline variables would be controlled for as one unit. This is not advised when using covariates as a method of controlling for baseline scores in a pre-post analysis (personal communication, Matthew Poes, September 10, 2012). MANCOVA also does not provide information on which group is greater, it only provides indication of group differences, thus resulting in more post-hoc tests and greater loss of power and degrees of freedom (person communication, Rich Ulrich, September 10, 2012). Furthermore, Huberty and Morris (1989) suggest that multivariate tests are appropriate for multivariate questions, whereas univariate tests are more appropriate for a series of univariate questions. It is generally advised to conduct an adjustment (such as a Bonferroni adjustment) to prevent potential type I error when many tests are run (such as in the present analysis plan). The Bonferroni adjustment is capable of reducing type I error through deflating the overall α applied to each test that is run (Perneger, 1998). Adjustments such as these may reduce type I error; however they increase type II error or the chance of falsely failing to reject the null hypothesis and failure to detect an effect that actually exists (Perneger, 1998). In cases of very small sample size where detection of group differences is already challenging because of lack of power, an adjustment for type I error could potentially mask existing effects (Garamszegi, 2006). Recent recommendations have suggested always providing effect sizes and/or confidence intervals to aid in determining the relevance and clinical significance of a given effect (Garamszegi, 2006). Thus, it was decided to not include an adjustment for type I error.

Prior to conducting the ANCOVA, an ANOVA was conducted to assess potential differences between treatment groups in enmeshment with symptoms at baseline. The potential interaction between the covariate of the baseline enmeshment with FMS and group (the assumption of homogeneity of regression slopes) was then tested in order to assess any potential violations of the assumptions behind ANCOVA. In cases in which this assumption was met, ANCOVA was performed with the baseline score on the outcome measure as the covariate.

Hypothesis 2: *There will be a significant difference between the ACT group and education group in post-intervention acceptance of pain as measured by the CPAQ, after controlling for baseline acceptance. Means will reflect greater increases in acceptance for the ACT group than the control group.* This was tested using an ANCOVA with baseline acceptance scores as the covariate and post-intervention acceptance scores as the dependent variable. The same reasoning was used in determining the test for this hypothesis as with hypothesis 1.

Hypothesis 3a & b: *Acceptance of pain will mediate the relationship between treatment group membership and enmeshment.* This was tested using Hayes' procedure for assessing mediation (Hayes, 2011). There are several advantages to the bootstrapping method compared to the traditional Baron and Kenny (1986) method and the Sobel test. Bootstrapping is a computer-intensive type of resampling procedure that "creates an empirical estimate of the sampling distribution of the indirect effect" (Hayes, 2009, pg. 7). According to Hayes (2009) the bootstrapping procedure treats the sample as a miniature representation of the population. Unlike the causal steps/Baron and Kenny method which determines the presence of an indirect effect by testing several hypotheses and applying the results to make a logical conclusion about the indirect effect, bootstrapping results in an estimate of the actual indirect (moderating or mediating) effect (Hayes, 2009). Most importantly, the bootstrapping approach has greater power than both the Baron and Kenny method and the Sobel test (Hayes, 2009). It should be noted that bootstrapping is considered to be one of the overfitting techniques cautioned against by Babyak (2004). So while some argue it has greater power and greater ability to detect effects within the sample (Hayes, 2009), these effects may not be relevant to the population and thus must be interpreted with caution (Babyak, 2004).

Participants

Demographic and study variable means and standard deviations are detailed in Tables 2 and 3. The average age of participants was 48.63 (SD = 12.96). Participants rated their average pain over the past week a mean of 7.21 (SD = 2.22) and their current pain M = 6.64 (SD = 2.02). The average level of fatigue was 6.19 (SD = 1.76). The majority of the sample was Caucasian (79.3%; African American 17.3%). T-tests revealed no significant differences between groups on any demographic variables (see Table 3) nor on severity of pain or fatigue.

Descriptive Analyses

Baseline Scores

Both the ACT and education group had similar scores at baseline; there were no statistically significant differences between treatment groups at baseline on any of the study variables (see Table 4). Both groups reported SIS scores showing moderate schema-enmeshment with FMS, pain, and other symptoms at baseline (see Table 5). It should be noted that there was a large range in SIS scores (see Table 5) indicating that some individuals were completely enmeshed with FMS or symptoms while others showed no enmeshment. Baseline acceptance of pain scores were low for both groups (see Table 5).

While SIS scores were generally low, it should be noted that the range and the variability or spread of the distribution was large, as demonstrated by the standard deviations. Furthermore, while it may appear that there were great differences in schema-enmeshment with FMS between groups, the standard deviations were large and the sample size was small making it challenging to detect statistically significant differences. Considering that the score for CPAQ-Activity engagement is out of a total possible 110 points with greater scores indicating greater involvement in activity despite pain, these means show that at baseline individuals in both groups were not very active or not willing to participate in activities when in pain. The CPAQ-Pain willingness score is out of a total possible 90 points with greater scores indicating more willingness to recognize that attempts to control pain are not fruitful, thus it would appear that at baseline individuals in both groups were making many unsuccessful attempts to manage or control the pain in maladaptive ways.

Correlations at Baseline

Since there were no significant differences between the two treatment groups at baseline, and because of the fact that at this time the groups had not yet received any differential treatment, the correlations were conducted with the entire sample. There was a large correlation between schema-enmeshment with FMS and schema-enmeshment with pain and fatigue. This is not surprising given that these are two primary symptoms of FMS. There were no significant correlations between enmeshment with “fibrofog” and any other variable (see Table 6). Significant moderate correlations were observed for the relationship between activity engagement and enmeshment with pain and fatigue (see Table 6). These correlations suggest that lower levels of activity engagement are associated with greater levels of schema-enmeshment. Pain willingness was also moderately correlated with schema-enmeshment with FMS. This pattern of correlations is what would be expected based on the nature of the constructs and how they are theorized to relate to one another in a group of women with FMS. What is noteworthy is that average weekly pain intensity was not significantly correlated with enmeshment with FMS ($r = -0.19$, $p = 0.38$). However, average weekly pain intensity was correlated with enmeshment with pain ($r = -0.42$, $p = 0.05$). Baseline fatigue was also not correlated with enmeshment with fatigue ($r = -0.23$, $p = 0.28$). These results indicate that symptom severity is not necessarily predictive of enmeshment.

Hypothesis Specific Results

Hypothesis 1

An ANCOVA was conducted to assess hypothesis 1: “*There will be a significant difference between the ACT group and education group in post-intervention enmeshment as measured by the PRISM and if this difference is significant, means will reflect greater reductions in enmeshment for those in the ACT group*”. The ANCOVA was used to compare the means of each group on the post-intervention schema-enmeshment while controlling for baseline scores as the covariate.

Enmeshment with FMS

There were no group differences at baseline (see Table 4), and the assumption of homogeneity of regression slopes was not violated. An ANCOVA revealed that treatment groups were statistically significantly different at post-intervention (see Table 7) after controlling for baseline scores. The main effect for group was small but significant, partial $\eta^2 = 0.19$ (see Table 7). Although not necessarily indicated by the ANCOVA method, in order to have a better understanding of the changes observed for each group, the average mean reductions per group were examined. It should be noted that this second approach serves more as a description of the changes in each group rather than a test of group differences at postintervention. Upon examining the group mean reductions in enmeshment, the ACT group displayed greater reductions in enmeshment with FMS compared to the educational control group. The ACT group displayed a reduction of –0.76 compared to only -0.49 in the control group. It is curious that such a small difference between groups would be significant. Thus, this hypothesis was also tested using the simple ANOVA method to account for the possibility of statistical error associated with the baseline as the covariate. The results of the ANOVA indicated that there was a statistically significant difference between groups $F(1, 24) = 6.27$, $p = 0.02$. This will be further addressed in later sections. However, it can be stated that in the case of enmeshment with FMS, hypothesis 1 was supported.

Enmeshment with Pain

There were no group differences at baseline (see Table 4), and the assumption of homogeneity of regression slopes was not violated. The ANCOVA revealed no statistically significant group differences in enmeshment with pain at post after controlling for pre scores (see Table 7). The ACT group reported a mean reduction of -0.69 compared to a mean reduction of -0.13 in the control group. Thus, hypothesis 1 was not supported in regard to schema-enmeshment with pain.

Enmeshment with Fatigue

There were no group differences at baseline (see Table 4), and the assumption of homogeneity of regression slopes was not violated. The ANCOVA to assess group differences in enmeshment with fatigue revealed statistically significant group differences (see Table 7). The main effect for group was small but significant, partial $\eta^2 = 0.26$ (see Table 7). As with schema-enmeshment with FMS, the average mean reductions per group were examined. The ACT group reported a mean change in enmeshment with fatigue of -3.31 compared to a mean change of 0.63 in the control group. Of note, the education group demonstrated a small increase in schema-enmeshment with fatigue. Thus, hypothesis 1 with regard to enmeshment with fatigue was supported.

Enmeshment with Cognitive Symptoms/Fibrofog

There were no group differences at baseline (see Table 4), and the assumption of homogeneity of regression slopes was not violated. The ANCOVA revealed statistically significant differences in enmeshment with cognitive symptoms between groups (see Table 7). The main effect for group was small but significant, partial $\eta^2 = 0.29$ (see Table 7). In order to have a better understanding of the changes observed for each group, the average mean reductions per group were examined, using the same method as for schema-enmeshment with FMS and fatigue. Once again, this approach is description of the changes in each group but it is not meant to serve as a test of group differences at postintervention. Upon examination of the group mean reductions in enmeshment, an interesting pattern emerged. The ACT group displayed reductions in enmeshment with cognitive symptoms (mean reduction of -5.02), whereas the control group displayed an increase (mean increase of 1.50). Thus, hypothesis 1 was supported in regards to schema-enmeshment with cognitive symptoms.

Secondary Analyses

Secondary analyses were conducted to assess whether severity of symptoms changed as a result of the intervention; if this were the case then perhaps this change may have played a role in changes in enmeshment. Severity of symptoms (pain and fatigue) did not significantly change over time within groups (see means in Table 5), nor was there evidence of significant between group differences following the intervention (see Table 7). In addition to the lack of movement in symptomology, the severity of these symptoms was not correlated with enmeshment with the respective symptoms.

Hypothesis 2

An ANCOVA was conducted to test hypothesis 2: "*There will be a significant difference between the ACT group and education group in post-intervention acceptance of pain as measured by the CPAQ and if this difference is significant, means will reflect greater increases in acceptance for those in the ACT group*". The procedure that was used to test hypothesis 1 was used for hypothesis 2. To test hypothesis 2, acceptance of pain was assessed using both subscales of the CPAQ as they tap into different components of acceptance as a construct. Thus, two different analyses were conducted in the examination of hypothesis 2.

Acceptance of Pain: Activity Engagement

There were no significant group differences in activity engagement at baseline (see Table 4); however, the assumption of ANCOVA was violated as the interaction between baseline activity engagement and group *was* statistically significant, F(1, 28) = 6.807, p =0.015. This significant interaction suggests that any group differences in the post-intervention score vary as a function of the covariate (in this case the baseline activity engagement) rather than the group. Further visual examination of the data via histograms of group scores revealed that although there was no significant difference in group means of activity engagement, the groups did in fact differ when it comes to the distribution of scores and this difference may have impacted the results of the test homogeneity of regression slopes. Thus, when examining the data as an intent-to-treat analysis, I was not able to adequately test hypothesis 2 in regard to pain acceptance in the form of activity engagement.

Because of the inability to test this hypothesis as an intent-to-treat analysis, the original dataset was used. This time, the interaction between baseline activity engagement and group was not statistically significant, indicating the assumption of homogeneity of regression slopes was not violated. The results of the ANCOVA, controlling for baseline activity engagement scores, revealed that treatment groups were statistically significantly different at post-intervention (see Table 7). Upon examining the group mean changes in activity engagement, the ACT group displayed greater changes in activity compared to the educational control group; the ACT group displayed a mean increase of 11.64 points compared to an increase of only 4.25 points in the control group. Thus, in the case of activity engagement hypothesis 2 was supported when examining the original dataset.

Acceptance of Pain: Pain Willingness

There were no group differences at baseline (see Table 4), and the assumption of homogeneity of regression slopes was not violated. The ANCOVA revealed that there were statistically significant group differences in pain willingness (see Table 7). In looking at the group means, the ACT group increased in pain willingness by a mean of 7.83, compared to the control group which experienced only a 0.50 change. Thus, hypothesis 2 was supported for acceptance of pain in the form of pain willingness.

Hypothesis 3

The third research question was divided into two parts: a) Does *activity engagement (acceptance of pain) mediate the relationship between group assignment and schema-enmeshment;* b) *"Does pain willingness (acceptance of pain) mediate the relationship between group assignment and changes in schema-enmeshment?"* It was hypothesized that both activity engagement and pain willingness would mediate the relationship between group membership and change in schema-enmeshment. To test these hypotheses, change in schema-enmeshment with FMS, fatigue and cognitive symptoms were tested as separate outcome variables, resulting in three separate mediation analyses for each hypothesis. Only these three outcomes were chosen as they were the only outcomes with significant group differences at post-intervention according to the ANCOVA analyses. For these analyses, treatment group membership (ACT vs. educational control) served as a dichotomous independent variable and change in either activity engagement or pain willingness served as the mediator variable.

To conduct these analyses, Hayes' (2011) procedures for conducting mediation with a multicategorical independent variable were used; this includes the MEDIATE macro using SPSS. Of note, when the independent variable is dichotomous it is treated as such by this macro. This procedure allows for the estimation of direct and indirect effects of all the variables in the model. The procedure follows the bootstrapping methods mentioned previously.

Does Activity Engagement Mediate Schema-Enmeshment with FMS?

The mediation approached statistical significance. A significant indirect effect through change in activity engagement on change in schema-enmeshment with FMS was detected, β = 2.06, SE =1.45 (CI= 0.0067-5.4052; see Table 8). A confidence interval which does not include zero indicates that the effect is statistically significant, and that it can be stated with confidence that the effect was different than zero (Thompson, 2002). In the present analyses, although the confidence interval does not include zero, the lower limit of the confidence interval is approaching zero. Thus, the results must be interpreted with caution, and may be considered a trend.

A visual examination of correlations was conducted as a way to further examine the relationship between schema-enmeshment and acceptance. This demonstrated that the relationship between activity engagement and enmeshment with FMS was different for the two groups at post-intervention. For the ACT group the association scores are no longer significant at post-intervention (*r* = 0.18, *p* = 0.50; see Table 9) nor is the association between *change* scores significant (*r* = 0.44, *p* =0.09; see Figure 7). However, for the Educational control group the correlation demonstrates little change from baseline and it is still significant (*r* = 0.75, *p* = 0.03; see Table 10); the correlation between *change* in activity engagement and *change* in enmeshment with FMS is significant as well for this group (*r* = 0.74, *p* = 0.04). This suggests that there is a lack of a relationship between activity engagement and schema-enmeshment with FMS among the ACT group; however this is a strong relationship indicating greater enmeshment is associated with less activity engagement for those in the educational control. To test whether it was possible that schema-enmeshment was the mediating factor and that the directionality of the relationship was opposite of what was hypothesized, an exploratory mediation analysis was conducted with change in schema-enmeshment as the mediator and change in acceptance as the outcome. This mediation was not significant, thus providing further support for change in acceptance as a mediating factor.

Does Activity Engagement Mediate Schema-Enmeshment with Fatigue?

The same mediational analyses as conducted above showed that activity engagement did not mediate the relationship between treatment group and schema-enmeshment with fatigue, β = 1.11, SE = 0.86 (CI= -0.10 – 3.22).

Does Activity Engagement Mediate Schema-Enmeshment with Cognitive Symptoms?

The same mediational analyses as conducted above showed that activity engagement did not mediate the relationship between treatment group and schema-enmeshment with cognitive symptoms, β = 1.15, SE =1.01 (CI= -0.46 – 3.59).

Does Pain Willingness Mediate Schema-Enmeshment with FMS?

The same mediational procedure as conducted above was used to assess hypothesis 3b. The mediation was not statistical significant, β = 1.47, SE =1.32 (CI= -0.32 – 4.57). This suggests that pain willingness does not mediate the relationship between treatment group and changes in schema-enmeshment with FMS.

Does Pain Willingness Mediate Schema-Enmeshment with Fatigue?

The same mediational analyses as conducted above showed that pain willingness did not mediate the relationship between treatment group and schema-enmeshment, β = 0.89, SE =1.13 (CI= -0.19 – 4.03).

Does Pain Willingness Mediate Schema-Enmeshment with Cognitive Symptoms?

The same mediational analyses as conducted above showed that pain willingness did not mediate the relationship between treatment group and schema-enmeshment with cognitive symptoms, β = 0.43, SE =1.21 (CI= -1.89 – 3.22).

Additional Analyses: Similarities with TST

The TST is one of the most widely used and accepted measures of self-concept (Grace et al., 2003). In this test, participants are given 20 spaces to answer the question “Who am I? In the present study, it was supposed that a moderate correlation between the TST and the PRISM might provide supporting evidence of the PRISM’s ability to detect self schema-enmeshment. For example, if an individual listed “fibromyalgia patient” as one of the first self characteristics, we might assume that this person would also have a very low SIS score on the PRISM since the PRISM is intended to be a measure of the relationship between self and FMS. Eight participants completed the TST (the addition of the TST was made after the majority of participants had been recruited). Of these eight, only 1 listed “fibromyalgia” as one of the 20 “self” descriptors. None of the women listed any descriptor related to chronic pain, fatigue, or any other physical symptom. The one woman who listed “fibromyalgia” as a descriptor listed it as number 7 out of 20. Given these limited findings, it would appear that among those who completed the TST there is not a relationship between the TST responses and the SIS scores on the PRISM.

DISCUSSION

The primary aim of this research was to examine the relation of illness with self, specifically the way in which FMS, pain and other symptoms become enmeshed in one's self-schema. This randomized controlled pilot study explored the implementation of ACT vs. a chronic pain self-management education intervention in 28 women with FMS. The study protocol specified that participants complete an average of eight, hour-long, individual sessions with a trained ACT therapist or FMS educator. It was hypothesized that the women in the ACT group would experience greater reductions in schema-enmeshment with all symptoms and greater increases in acceptance of pain compared to the women in the educational control group. It was also hypothesized that should there be group differences in schema-enmeshment following the intervention, changes in acceptance would mediate the relationship between treatment group membership and changes in schema-enmeshment.

Hypothesis 1: Self Schema-Enmeshment with Symptoms

Hypothesis 1 postulated that there would be statistically significant group differences in schema-enmeshment with FMS, pain, fatigue, and cognitive symptoms following the intervention, and that the ACT group would experience greater reductions in schema-enmeshment with each of these constructs compared to the educational control group. Hypothesis 1 was supported when it came to schema-enmeshment with FMS, fatigue, and cognitive symptoms, but not pain.

An interesting finding was the fact that there was a significant group difference in schema-enmeshment with FMS, when the reported difference in average reductions was relatively small (-0.76 for the ACT group and -0.49), accounting for a between groups difference of 0.27. It is surprising that this small difference was statistically significant, especially given the small sample size of the study. It should be pointed out that the analyses using the ANCOVA and the average mean change scores are two different approaches to the problem. The ANCOVA effect size of partial $\eta^2 = 0.19$ is indicative of a very small yet significant group effect. However, the mean different scores describe the difference from baseline to postintervention within each group. Examination of the change scores and the difference between change scores provides a different type of information – one that is more descriptive than statistical - than the ANCOVA test. Thus the mean reductions in schema-enmeshment should only be considered as another way to understand the data. It should be noted that the two treatment groups were in fact different at baseline, although this difference was deemed non-significant (see Table 4), likely due to limited power. Thus, in examining postintervention means in schema-enmeshment with FMS, it may be that a small reduction may have been just enough change required to widen the gap between groups, making it large enough to be detected with limited power.

Although the effect size of the ANCOVA was small yet significant in nature, this does not imply that this difference is necessarily clinically significant. The self-illness-separation score (SIS) on the PRISM is measured in centimeters. The size of the radius for the “self” disk is 3.5 cm and the size of the radius for the symptom disks is 2.5 cm (see Figure 2). Thus even a small reduction in SIS could be clinically meaningful as a reduction of approximately 1 cm could completely eliminate overlap between the two disks. For schema-enmeshment with FMS a mean reduction of -0.76 is likely not indicative of a statistically significant difference. This is further evidenced by the fact that within group analyses of changes in schema-enmeshment were not significant for schema-enmeshment with FMS. In the case of schema-enmeshment with fatigue, a mean reduction of 3.31 in the ACT group is meaningful as it implies little to no overlap between the self disk and fatigue disk, even for the most enmeshed person in the group. For schema-enmeshment with cognitive symptoms, a mean reduction of 5.02 implies that none of the participants reported any overlap between self and “fibrofog” disks.

A plausible explanation for the changes in enmeshment with FMS and symptoms of fatigue and cognitive symptoms among the ACT group may lie in two of the core principles of ACT: defusion and self-as-context. Defusion encourages individuals to remove the literality of thoughts and simply view them non-judgmentally, whereas self-as-context teaches participants to experience the self as a stable perspective from which experiences (such as thoughts and feelings that are constantly changing) can be observed without becoming attached to them (Hayes et al., 2006). Stated simply, people are not defined by their thoughts, feelings, or experiences. Just because someone has fatigue this does not mean that they *are* the fatigue; fatigue is something that happened to them, not who they are as a person. When defusion and self-as-context are working together it may result in differentiating oneself from the experience of pain, fatigue or other symptoms and from thoughts about being a “FMS patient” or a person hindered by physical symptoms. Furthermore, defusion and self-as-context work often supports acceptance (Hayes et al., 2012) and may have led to other cognitive and behavioral changes which will be discussed in subsequent sections.

However, this does not explain why there were no group differences in schema-enmeshment with pain. The original premise was that as one became more accepting of the physical pain associated with FMS as simply an experience, then the more likely one would be to separate pain from their sense of self. An interesting pattern of results emerges when looking at the amount of change in enmeshment with each symptom. The greatest amount of change occurred for enmeshment with cognitive symptoms, followed by enmeshment with fatigue, then enmeshment with FMS, and finally no significant change in enmeshment with pain. This is counterintuitive as pain is considered a primary symptom of FMS. One possible explanation is that for some individuals, other symptoms (such as fatigue or cognitive symptoms) have been a bigger component of self than pain. In fact, 10 of 24 (41.7%) participants had greater or equal schema-enmeshment with fatigue at baseline than with pain. Furthermore, although baseline ratings of pain intensity and fatigue intensity were essentially equal (see Table 5), interference ratings were discrepant. Average fatigue interference was rated as a 6.07 (SD = 2.05) on the BFI; ratings greater than 7 indicate “severe fatigue” or more severe impairment in functioning (Mendoza et al., 1999). Average FMS physical interference was rated as a 1.40 (SD = 0.81) out of 3 on the FIQ-Physical Interference Subscale, indicating a moderate level of impairment from FMS symptoms. This suggests that interference from fatigue may have been a greater concern than interference associated with FMS as a whole. There were no measures of pain interference, which might have clarified the findings. In accordance with ACT principles, if another symptom was causing the greatest amount of distress or the greatest impact on self then conversations in session may have focused more on fatigue or FMS as a whole rather than “pain”. This is further evidenced in the larger effect sizes for cognitive symptoms and fatigue than FMS as a whole construct (see Table 7). Post-study conversations with the ACT interventionists confirmed that often the focus of ACT exercises was not accepting the pain per se but accepting the experience of living with FMS (which includes the other associated symptoms).

A different potential explanation may be that perhaps prior to the intervention individuals reported lower levels of schema-enmeshment with pain because of avoidance of pain or denial rather than because of acceptance. Interventionists reported that many participants reported using distraction techniques or other forms of avoidance to cope with pain. This is consistent with work that demonstrates a high rate of pain avoidance in FMS populations (Bennett et al., 2007; Turk et al., 2004). For example, in a sample of 2569 women with FMS, 80% reported use of distraction techniques such as watching TV or reading to manage pain (Bennett et al., 2007). If this were the case in this sample, then it is plausible that self and pain were not enmeshed, as pain was something to be actively avoided, in which case incorporating pain into one’s self schema would have been unlikely because of our desire to preserve a positive sense of self. Of course, this possibility is speculative in nature and further study is warranted in order to better understand the changes in schema-enmeshment and cognitions over the course of the intervention.

Hypothesis 2: Acceptance of Pain

Hypothesis 2 stated that there would be statistically significant group differences in changes in acceptance of pain, and that the ACT group would experience greater increases in pain acceptance than the control group. Pain acceptance consists of activity engagement and pain willingness.

Hypothesis 2 was supported for pain willingness. These results indicate that the ACT group did report that their beliefs about experiencing pain had changed from before the intervention. A significant change in pain willingness following the intervention is consistent with previous research on ACT for chronic pain (McCracken & Eccelston, 2005; McCracken et al., 2005). When attempting to determine that magnitude of change for subscales such as this, Norman, Sloan, and Wrywich (2003) suggest a general principle that when changes are greater than half a standard deviation then they can be considered practically significant. A mean increase of 7.83 units in pain willingness for the ACT group is indicative of a change that is 2.46 units greater than half the standard deviation for the subscale (5.375). Furthermore, analysis of within group data reveals a statistically significant difference from baseline to postintervention $t(17) = 3.40$, $p \leq 0.01$, $d = 0.80$. Taken together, the change in pain willingness can be interpreted as a large effect which is likely to reflect large clinical gains, especially when compared to the education group which demonstrated little to no movement in pain willingness (see Table 5).

Hypothesis 2 was also supported for activity engagement. However, for activity engagement this hypothesis was tested using the original dataset because when examining the intent-to-treat dataset, violations of assumptions surfaced. Since all other analyses were conducted with the intent-to-treat dataset, these findings should be interpreted with caution. Testing of the hypothesis showed that the ACT group experienced a large change in activity engagement (which was significantly different from baseline) and the educational group experienced only a small change (which was not significantly different from baseline). Specifically, following the intervention, ACT participants were significantly more likely to continue to participate in various activities regardless of pain than they were prior to the intervention *and* in comparison to the educational control group. This is consistent with previous research of ACT and ABIs for various chronic pain conditions (McCracken & Eccelston, 2005; McCracken, Vowles, & Eccelston, 2005). A mean increase of 11.64 in activity engagement for the ACT group is also greater than half a standard deviation (5.36), indicating clinical significance when using the recommendations of Norman and colleagues (2003). Within group analyses reveal statistically significant differences in activity engagement from baseline to postintervention, $t\ (17) = 3.55$, $p \leq 0.01$, 0.84. Thus, the change in activity engagement can be interpreted as large in effect and likely indicative of a clinically meaningful difference.

The results of hypothesis 2 suggest that participants in ACT experienced changes in both the way they thought about the experience of pain and their attempts to control pain (pain willingness) and their ability to live an active life even in the presence of pain (activity engagement). One of the core tenants of ACT is acceptance, which teaches that acceptance involves acknowledging and embracing internal experience (thoughts, feelings, bodily sensations) without attempting to change these when doing so would cause psychological harm (Hayes et al., 2006). This may have translated into both more pain willingness and more activity engagement, as an individual may be able to simply recognize she has pain without jumping to thoughts and behaviors that would be destructive (such as “I can’t play with my children today because it will hurt too much”). Equally important, ACT emphasizes committed action to work toward one’s identified values even in the presence of pain or challenging emotions or thoughts (Hayes et al., 2012). The intervention based on these principles may have led participants to behave in different ways which would then be reflected on the CPAQ. These findings and interpretations are consistent with previous studies of ACT with chronic pain samples. Chronic pain patients receiving ACT have demonstrated gains in both activity engagement and pain willingness as measured with the CPAQ (McCracken et al., 2008; Vowels & McCracken, 2008) as evidenced by greater attendance at work (McCracken, 1998) and less utilization of medical services (Dahl et al., 2004). The core tenants of ACT may have played a role in the changes in acceptance of pain among those who participated in this arm of the study.

Hypothesis 3: Acceptance of Pain as a Mediator

Hypothesis 3 proposed that changes in activity engagement and pain willingness would mediate the relationship between treatment group membership and changes in schema-enmeshment with each of the constructs that had significant group differences at post-intervention (FMS, fatigue, and cognitive symptoms). Activity engagement *only* mediated the relation between group membership and schema-enmeshment with FMS. Pain willingness did not mediate any relationship between group membership and schema-enmeshment.

The relation between activity engagement and schema-enmeshment with FMS at baseline appeared to be following the same pattern for both groups; greater enmeshment was associated with less activity engagement. Individuals who are heavily enmeshed with FMS may come into activities with thoughts such as “I can’t do this because I have FMS”. These thoughts then prevent them from engaging in life activities (Dahl & Lundgren, 2006). Individuals who believe they cannot engage in life activities because of FMS symptoms, and therefore do not do anything, would observe their behavior and over time come to think of themselves as someone whose life is defined by FMS. This sequence of impact of cognitions on behavior is supported by both ACT (Dahl & Lundgren, 2006) and self-perception theory (Bem, 1972). Following the intervention period of the study, the relation between activity engagement and enmeshment with FMS is different for each group; participants in the educational control group reported a relationship that closely resembled the relationship at baseline, i.e. there was no change (see Figure 7). For the ACT group, however, the relationship between activity engagement and enmeshment is no longer there.

One possible interpretation of these findings is that participants in the ACT group adopted ACT principles for living with their FMS. They learned that no matter what they are experiencing cognitively or emotionally (such as thoughts consistent with schema-enmeshment) they must still continue to work in service of their life values (Dahl & Lundgren, 2006; Hayes et al., 2012), thus possibly resulting in a stable level of activity engagement regardless of the level of schema-enmeshment present. According to ACT principles, schema-enmeshment (fusion with thought) should not drive behavior; values are what should direct behavior regardless of cognitive or physical obstacles (Dahl & Lundgren, 2006; Hayes et al., 2012). It would appear that the findings are consistent with this idea and the overall principles of ACT.

The fact that activity engagement did not mediate the relationship between group and schema-enmeshment with fatigue as hypothesized is somewhat puzzling, as one might expect fatigue to be related to activity engagement, such that the more fatigue the less likely someone will be to participate in life activities. The most reasonable explanation for the null findings for hypothesis 3 rests in the design of the activity engagement instrument. The CPAQ was designed specifically to assess acceptance of pain (McCracken et al., 2004). As pain is a symptom of FMS, but distinct from the others, the measure may have captured the mediation when asked about FMS but not symptoms distinct from pain.

On the other hand, it is not surprising that activity engagement did not mediate the relationship between group and schema-enmeshment with cognitive symptoms, for several reasons. First, as previously mentioned the measure was designed to assess the extent to which someone continues to participate in life activities despite pain, it does not specifically assess the impact of any cognitive symptoms on activity engagement. Secondly, it is plausible that the experience of memory difficulty, inattention, and confusion (all components of cognitive problems or fibrofog) would have less impact on physical activities compared to pain or other physical symptoms. People with FMS have reported that cognitive challenges often create difficulty at work and in interpersonal relationships (which are not addressed in the measure of activity engagement), whereas pain and fatigue are cited more often as interfering with physical activity (Arnold et al., 2008). It is worth mentioning that the ACT group did report significant reductions in cognitive symptoms compared to the control group; however the role of acceptance in creating this difference is not clear as “acceptance of cognitive challenges” or “cognitive activity engagement” was not directly measured.

It is possible that pain willingness did not mediate the relationship between treatment group membership and schema-enmeshment with any construct due to measurement issues such as those addressed above. The pain willingness subscale includes questions specifically targeted to willingness to experience pain without attempting to control it and does not address fatigue or cognitive symptoms. It should also be noted that the lack of sufficient statistical power may have played a role in the non-significant findings. It may also be that individuals pay more attention to behaviors that are associated with activity engagement (rather than lack of control behaviors which would be associated with pain willingness). Thus attention to changes in overt behaviors may be what is reflected upon by the patient and this in turn lead to changes in thoughts about the self in relation to pain and illness. However, this explanation is somewhat speculative in nature and greater study of the differences between activity engagement and pain willingness is warranted.

Attempts to Explore Construct Validity of the PRISM

It is still a bit unclear as to what the PRISM really measures. The present study attempted to compare the PRISM data with that of the TST to establish construct validity and the ability of the PRISM to assess schema-enmeshment of self and illness. There were several problems with this approach. First, there was a lack of data to assess; only eight individuals completed the TST which severely limits the ability to make comparisons and detect similarities between the two measures. Secondly, there is an issue of face-validity and social desirability. The TST simply asks one to list 20 responses to the statement "I am…" An individual may actively chose *not* to list "fibromyalgia patient" on the TST simply because they recognize that this may portray them in a negative light. Many individuals with FMS state that they try not to advertise that they have FMS for fear that others will judge them or treat them differently as FMS is often stigmatized (Asbring & Narvenen, 2002; Stahl, 2001), which demonstrates the negative connotation that the label "fibromyalgia patient" carries. Thus, even though the participants knew they were in a FMS study, they may have been unwilling to overtly define themselves in such a way. This could be related to our innate desire to protect our sense of self and the phenomenon of self-enhancement in which we have an almost natural inclination to "maintain or increase the positivity (or decrease the negativity) of one's self-concept [or] the desire to maintain, protect, and enhance one's self-esteem" (Leary, 2007, pg. 319). Humans go to great lengths to self-enhance including disregarding information that threatens their self-esteem and presenting themselves in ways that cast themselves more positively especially in relation to others (Leary, 2007). Taking all of this into consideration, it is possible that the TST was not the best choice of assessment to use as a measure of construct validity.

Perhaps the PRISM is a less face-valid instrument which would provide a less threatening way for individuals to discuss their FMS and symptoms. Interventionist notes and recordings demonstrate that individuals would often make statements which indicated that they clearly grasped how to complete the PRISM and what the constructs meant in relation to each other. For example a participant who was completely enmeshed (placed the FMS disk directly on top of self: SIS = 0) stated “It’s all of me, it’s my whole life”. This is also consistent with the work of Buchi and colleagues (2002) which found that 98% participants answered the PRISM in a manner that was aligned with the PRISM being a valid measure of the association of their self with illness.

Importantly, in this study, the PRISM of FMS, pain, and fatigue *was* moderately correlated with activity engagement at baseline (see Table 5). This pattern of results is consistent with what one might expect based on the cognitive- behavioral assumption that cognitions tend to drive behavior. At baseline, none of the participants had been exposed to ACT ways of thinking which would emphasis less cognition-based action, thus an association between thought and reported behavior is not surprising. This association is not seen at post intervention as some participants had been exposed to ACT. Although this is not an example of construct validity, as it would have been if the PRISM and TST were highly correlated, it is at least encouraging that the results created by the PRISM are demonstrating the expected the pattern.

Based on the limited data provided by this study, it cannot be concluded that the PRISM is a valid measure of sense of self; however it cannot be concluded that it lacks construct validity either. Previous work suggests that the PRISM can indeed detect relationships between the self and illness (Buchi et al., 2002; Denton et al., 2004; Kassardjian et al., 2008; Sharpe et al., 2006; Steiner, 2010) and that it is better correlated with other implicit or less face-valid ways of assessing self (Steiner, 2010). Future large-scale validity studies are needed to be able to definitively state that the PRISM is a measure of schema-enmeshment of self and illness. At this point, there does appear to be mounting evidence that the PRISM adequately assesses schema-enmeshment or at least a closely-related construct.

Directions for Future Research

Several of the findings discussed above suggest directions for future research. Future research should further examine the role of acceptance in changes in schema-enmeshment with fatigue. In the present study enmeshment with fatigue was greater than enmeshment with the disease as a whole; additionally FMS patients often state that fatigue is one of the most challenging symptoms to manage (Soderberg & Lundman, 2001). However, fatigue is rarely discussed or studied as a main symptom and is generally treated as secondary to pain. Thus studying individual's ability to engage in life despite fatigue with a measure that is designed specifically to assess fatigue may yield important findings. A review of the literature suggests that no such measure currently exists. It may be possible to simply modify the CPAQ by changing the word "pain" to "fatigue"; however this would have to be psychometrically validated before it could be used in research.

Another potential area of research could be exploring and strengthening the validity of the PRISM as a measure of schema-enmeshment. Some suggest it is the association between self and the *burden* of illness (Buchi et al., 2002; Buchi et al.,2000; Kassardjian et al., 2008), and some suggest it is another measure of schema-enmeshment, e.g. the association of the illness itself as a part of one's self (Denton et al., 2004; Sharpe & Curran, 2006). Part of the problem is a lack of clarity in the constructs themselves as it could be argued that “schema-enmeshment of self and illness” and “association between self and the burden of illness” are the same construct. Although there has been some initial work in validating the instrument as a measure of schema-enmeshment, further study is warranted.

A large area for future research would be the exploration of the processes or the mechanisms of change in behavior and relationship with thoughts associated with ACT. In the present study, activity engagement which is a form of pain acceptance was a predictor of group differences in change in schema-enmeshment with FMS. However, activity engagement is really a behavior that is consistent with acceptance and other ACT principles. It is not clear whether it is acceptance, defusion, commitment to action, or even a better understanding of self-as-context that is driving the changes seen in schema-enmeshment. Following several criticisms regarding the lack of research on the mechanisms of action in ACT (Arch & Craske, 2008; Asmundson & Hoffman, 2008) the literature is beginning to show a growth of interest in identifying the processes underlying change in ACT (Hayes et al., 2010; Lundgren, Dahl, & Hayes, 2008; Wicksell et al., 2008).

Although a great deal of the literature on ACT for chronic pain supports the notion that ACT creates changes in acceptance of pain as measured by the CPAQ (as seen in the present study), there is some competing evidence. Wetherall and colleagues (2011) found that ACT did not produce any significant changes in acceptance compared to CBT, and that ACT participants did not significantly increase acceptance in comparison to those who received CBT. It appears that research supporting ACT related changes in pain acceptance is limited to comparing ACT to control or waitlist groups

(McCracken & Eccleston, 2005; McCracken et al., 2005) or lack a comparison arm (Vowles & McCracken, 2008). Thus, although the results presented here are consistent with the majority literature stating that ACT is effective compared to controls, it is not yet clear that ACT is superior to existing evidence-based treatments. Unfortunately, this study does not provide any additional information in regard to that question; future research should attempt to address whether results can be replicated in FMS when compared to interventions such as CBT.

Finally, a next step from this research may be to examine what types of behaviors and experiences (other than activity engagement) are associated with schema-enmeshment. Perhaps greater enmeshment is associated with more symptoms of depression, poorer quality of life, or greater difficulty in various life domains. ACT has demonstrated efficacy in treating depression and increasing quality of life (Wetherall et al., 2011) in chronic pain populations; however depression and quality of life have not been examined as mediators of the relationship between FMS and its symptoms or in relation to schema-enmeshment. Schema-enmeshment may act as another mediating factor or mechanism of change for depression or quality of life, and these potential relationships may be further explored.

Clinical Implications for FMS

The results of this study provide support for the use of ACT with individuals with FMS. The data suggests that receiving ACT was related to increases in pain acceptance (particularly activity engagement) and reductions in schema-enmeshment. This is an important finding as disability and submission to illness are common among those with

FMS (Kurtze, Gundersen, & Svebak, 2001; White, Birnbaum, Kaltenboeck, Tang, Mallet, & Robinson, 2008). These experiences may create or reinforce negative thoughts about the self, which in turn serve to solidify the enmeshment of self and illness, what Hayes et al. (2012) refer to as cognitive fusion. Because ACT encourages activity engagement and working toward values-based goals regardless of pain (Vowles & McCracken, 2008), individuals with FMS may be able to break the cycle of disability which may change their thoughts about self, as demonstrated in the present study. This is congruent with findings of Wicksell and colleagues (2008) who suggest that acceptance processes are responsible for changes in cognitive fusion with thoughts about pain and pain/disability behaviors (which could be thought to be related to schema-enmeshment). Thus, ACT appears to be an effective way to assist people with FMS to become active again and rebuild a life that is not defined by their illness.

Other potential clinical implications may lie in the relationship of schema-enmeshment with quality of life or psychological well-being. Low SIS scores on the PRISM have been correlated with depression (Buchi et al., 2002) and depression is a common concern in people with FMS (Gormsen, Rosenberg, Bach, & Jensen, 2010). Although it was not explicitly explored in the present study, reductions in schema-enmeshment may be associated with reductions in depression and increases in well-being. Future research should aim to address this possibility. If this were the case, then ACT would be an intervention that could be used to target multiple aspects of living with FMS: disability, sense of self and psychological well-being.

Future Directions for the PRISM: Clinical Utility Within an ACT Framework

Although it is still unclear as to *exactly* what the PRISM measures, there may still be a good deal of clinical utility to this instrument. As mentioned before, the PRISM is a less intrusive way of asking an individual the extent to which they have allowed their physical condition to become a defining aspect of self. By going through the process of visually depicting the relationship between self and illness (rather than labeling oneself *as* the illness as one would with the TST) the individual may be more forthcoming or less susceptible to pressures of social desirability.

Additionally, completing the PRISM task in the presence of an interventionist or therapist allows the task to serve as an opening for a conversation about the way in which fibromyalgia (or any other symptom or illness) has played a role in the individual's life. The interventionists revealed that many times participants would place the disk on the board and spontaneously start to explain why it belongs in that place; however the interventionist could easily prompt the individual to explain. Secondly, the PRISM was significantly moderately correlated with activity engagement as measured by the CPAQ-AE at baseline, suggesting that schema-enmeshment of self and FMS and pain (see Table 5) is associated with less activity. Perhaps the PRISM is a good indicator of how behavior is related to enmeshment or the fusion with thoughts. Using the PRISM and in conjunction with a measure of behavior (such as the CPAQ-AE) could be informative to the therapist but it could also be an illuminating moment of understanding for the client. This process could be very useful in a therapeutic setting, particularly during an intake or early session as a means of not only assessing the level of impact but also as a method of building a therapeutic alliance.

Using the PRISM as a tool within the ACT framework may be especially appropriate. ACT traditionally uses several elaborate metaphors and experiential activities to aid therapists and clients in developing a new perspective around the source of suffering (Hayes et al., 2012). The PRISM is by definition a “hand-on”, experiential exercise and so it is consistent with other ACT practices and thus would not be out of place in an ACT session. The tool itself could be used to further demonstrate several of the ACT tenets. For example, if an individual places the “symptom” disk directly on top of the “self” circle and makes a statement such as “The pain has completely taken over my life; it’s who I am now”, then the ACT therapist may wish to use this to discuss cognitive fusion and how the individual is fused with this thought. The therapist may then start to do defusion work. Another perhaps even clearer use of the PRISM, may be to start self-as-context work. In the given example, the therapist could explain to the individual that they are currently taking the experience of pain and literally defining their self within that context. Self-as-context can be a difficult concept for people to understand and grasping the concept often requires a great deal of help from the therapist (Hayes et al., 2012), but the general principle is that “self” is a stable construct and experiences happen around it; the self is not the experience; in the case of chronic pain or FMS: you are not your illness. By using the experiential PRISM exercise, therapists could explain how experiences happen around the “self” circle; this may help to clarify some of the more abstract aspects of self-as-context. Finally, the PRISM could potentially be used to do values work. In this case, the yellow circle would still be “self” but the other disks may represent valued life domains; the distance between self and the disks would then indicate how central certain values are to the individual or how successful the individual has been in working accordingly with said values. Importantly, if the PRISM were to be incorporated in an ACT practice, it does not have to be limited to identification of self and illness (as the instrument title suggests), it could potentially be used for any form of suffering.

Limitations

No study is without limitations. The primary areas of concern for this study are the small sample size, concerns for external validity, concerns for internal validity, and lack of clarity in the constructs being assessed.

It is well known that small sample sizes lack statistical power or the ability to detect significant effects should they be present (Keith, 2006). Given that this study had a total sample size of only 28 participants, there is good reason to question the statistical power and ability to detect effects. Yet, despite the small sample size, significant effects *were* detected. There are two possible ways of explaining this situation. Given the small sample size, and given that effects were found, the effects must be strong in magnitude to appear with such limited statistical power (Slavin & Smith, 2008). Alternatively, it is possible that the detected effects are actually the result of statistical anomaly or type I error. This second conclusion may be less likely when tests are run with the variables specified a priori with a strong theoretical rationale (as was done in the present study). This will reduce erroneous testing which increases risk for type I error (Babyak, 2004). Although the small sample size is recognized as a limitation, it should be noted that other pilot studies of ACT for chronic pain used even smaller samples (Dahl et al., 2004) and also found significant effects. The present study serves as a pilot to assess the feasibility of this type of study for future research that will attempt to replicate these findings with a larger sample size.

External validity, or the extent to which the results of a study can be applied to people and situations outside of the controlled study environment (Kazdin, 2002), is an area of concern for this study. First, this study used a sample of only women. The decision to do this was based on the current statistics on FMS which indicate that 90% of those diagnosed with FMS are women (National Institute of Arthritis and Musculoskeletal and Skin Disease; NIAMS, 2011). However, there are men who are diagnosed with FMS and the results may not be applicable to them. Men may have very different ways of reacting to FMS and it is possible that they may have more or less schema-enmeshment of self with FMS then their female counterparts. It is also plausible that men may have a different response to ACT procedures; however ACT has been used successfully for men in chronic pain before (Dahl et al., 2004; Wetherall et al., 2011).

Related to the issue of external validity are the specific characteristics of the present sample that make them unique from the overall FMS population. One of these characteristics is volunteer bias. Although several methods of recruitment were used, a sizable portion of the sample were recruited from the database of individuals who have either previously participated in FMS research or those who have indicated that they are interested in participation. It is possible that the women who were interested in participating in research are fundamentally different than those who choose not to become involved in FMS research. All of the women in this study volunteered to participate which indicates a desire to try something new; this motivation may have predisposed them to respond positively to treatment. A large concern with volunteer bias is that it may have led to a sample that is substantially different from the population, making results difficult to generalize. However, some researchers argue that volunteer bias is less of a concern in trials where participants agree to participate prior to randomization without knowledge of their group assignment (Tripep et al., 2010) as in this study.

Finally, women who screened positive for potential personality disorders were excluded from the study. This could severely limit generalizability, as it estimated that 7% of women with FMS also have a co-morbid personality disorder (Fietta, Fietta, & Manganelli, 2007). Potential personality disorders were excluded from this study for two reasons: 1) personality disorders are long-standing and resistant to short-term treatment and could possibly derail the focus of an intervention aimed specifically at suffering related to a medical condition, 2) there is a small body of research that suggests that many of the co-morbid FMS/personality disorder diagnoses are inaccurate and that FMS can actually be reliably differentiated from Borderline Personality Disorder (Jochims et al., 2006). Regardless, by excluding those with personality disorders, the results of this study may be applicable only to those without these types of disorders.

Although this study does pose some concerns related to internal validity, great precautions were taken to maximize validity. One of the concerns with any intervention trial is the possibility of contamination from one condition to the other. In order to guard against this, the educators received no training in the actual practice of ACT. Additionally, both interventions were manualized to facilitate fidelity to the intervention and all sessions were audio-recorded and audited for fidelity to the intervention.

Additionally, the ACT interventionists received weekly group supervision from an expert ACT therapist in order to ensure that treatment was consistent with ACT principles and to ensure uniform delivery of the intervention.

Another potential limitation is the fact that the PRISM was administered by the interventionists. This is problematic for two reasons. First, the study had several different interventionists and thus there is the possibility for systematic error in administration based on the natural presentation style of the interventionist. Similarly, the interventionists were not blind to the participant’s group membership and it is possible that this information may have influenced administration of the measure. Third, participants may have been inclined to respond in a manner that would indicate improvement out of desire to please their interventionist. The first issue is less problematic as the instructions for the PRISM were scripted and all interventionists were trained in administration. However, the possibility of biased responses due to interventionist administration is a valid concern. Future studies should attempt to have a neutral member of the research team administer the PRISM or use a computerized version of the measure.

Issues for Further Consideration

It is not possible to conclude that ACT directly or definitively led to the reductions in schema-enmeshment among those who participated in that arm of the study, as we cannot completely rule out the contribution of variables or factors which were not measured or controlled. However, it is logical to conclude that the intervention created this group difference as other factors (such as baseline level of enmeshment, and fidelity to the intervention) were controlled by the researcher, and demographic factors were equal across groups due to randomization. Additionally, in the cases of enmeshment with fatigue and cognitive symptoms, the ACT group reported enmeshment that was significantly different from that of their education counterparts. This would suggest that changes in enmeshment were not simply due to common factors effects such as simply having the opportunity to talk with someone about FMS.

The control condition may have impacted the results. The educational control condition focused on providing pain self-management techniques; thus the participants in this group were receiving a type of active treatment. This may be considered beneficial in that it creates equality between treatment groups on all variables except those of interest; however these techniques may have actually reinforced pre-existing thinking about pain. It has been documented that FMS patients often feel that their condition is something to be managed (Arnold et al., 2008) and that patients are eager to learn new ways to alleviate or attenuate their symptoms (Bennett, 1996). The educational condition may have created a greater affiliation with beliefs about controlling symptoms which may have translated into greater or at least sustained schema-enmeshment. This emphasis on control is viewed as the problem within an ACT framework (Dahl & Lundgren, 2006), and it is actively discouraged in ACT. It is possible then that the education group was “held back” by reinforcing control as the answer. In essence, the control group may have actually served as the opposite treatment of ACT, rather than a neutral comparison, which may have led to group differences which would not have been seen otherwise.

The validity of the PRISM as a measure of schema-enmeshment needs to be further studied. As a test of validity, the present study attempted to compare the PRISM to the TST. There were several problems with this approach. First, there was a lack of data to assess; only eight individuals completed the TST which severely limits the ability to make comparisons and detect similarities between the two measures. Secondly, there is an issue of face-validity and social desirability. The TST asks one to list 20 responses to the statement “I am…” An individual may actively chose *not* to list “fibromyalgia patient” on the TST simply because they recognize that this may portray them in a negative light. Many individuals with FMS state that they try not to advertise that they have FMS for fear that others will judge them or treat them differently, as FMS is often stigmatized (Asbring & Narvenen, 2002; Stahl, 2001), which demonstrates the negative connotation that the label “fibromyalgia patient” carries. Thus, even though the participants knew they were in a FMS study, they may have been unwilling to overtly define themselves in such a way. On the other hand, the PRISM instructions specifically asked about FMS and symptoms. Interventionist notes and recordings demonstrate that individuals would often make statements which indicated that they clearly grasped how to complete the PRISM and what the constructs meant in relation to each other. For example a participant who was completely enmeshed (placed the FMS disk directly on top of self: SIS = 0) stated “It’s all of me, it’s my whole life”. This is also consistent with the work of Buchi and colleagues (2002) which found that 98% participants answered the PRISM in a manner that was aligned with the PRISM being a valid measure of the association of their self with illness. Taking all of this into consideration, it is possible that the TST was not the best choice of assessment to use as a measure of construct validity.

Based on the limited data provided by this study, it cannot be concluded that the PRISM is a valid measure of sense of self. Previous work suggests that the PRISM can indeed detect relationships between the self and illness (Buchi et al., 2002; Denton et al., 2004; Kassardjian et al., 2008; Sharpe et al., 2006; Steiner, 2010) and that it is correlated with other implicit or less face-valid ways of assessing self (Steiner, 2010). Future large-scale validity studies are needed to be able to definitively state that the PRISM is a measure of schema-enmeshment of self and illness. At this point, there appears to be mounting evidence that the PRISM may adequately assess schema-enmeshment or at least a closely-related construct.

Related to the above, there are several concerns related to the lack of clarity of both the constructs and the measures used in this study. The measurement of self-concept is notoriously difficult and schema-enmeshment is an abstract construct. The nature and language of ACT as a therapy modality contributes to the confusion. ACT uses several terms that were created explicitly for ACT (e.g. defusion, self-as-context) and others that do not make intuitive sense (e.g. acceptance; psychological inflexibility). There is an ongoing discussion in the literature as to how to best measure certain constructs associated with ACT (Grossman, 2011). In the present study, the PRISM was used primarily as a measure of schema-enmeshment, but schema-enmeshment can be thought of as equivalent to cognitive fusion with thoughts about FMS. ACT conceptualization stresses fusion with maladaptive thoughts and behaviors (Hayes et al., 2012), which could be interpreted as schema-enmeshment (as it was thought of here). Lack of clarity and lack of a unifying model of enmeshment are a limitation resulting from of the abstract constructs rather than study design. Research needs to continue to attempt to clearly define these constructs, create ways to measures them in a valid manner, and develop a unifying model.

Conclusions

This pilot study of a randomized controlled intervention of ACT for FMS was the first study to examine self schema-enmeshment with pain and illness in relation to ACT. The study provides encouraging evidence that ACT is capable of producing changes in self schema-enmeshment with the condition itself as well as two symptoms: fatigue and cognitive difficulties. Importantly, the results indicated that ACT was capable of producing significant increases in acceptance of pain, specifically activity engagement. It appears that changes in schema-enmeshment are related to changes in activity engagement, and activity engagement may actually be a mechanism of action for changes in enmeshment. Thus, it seems that ACT shows promise for the treatment of FMS, specifically changes to one’s self-concept and the extent to which people allow their life and identity to be defined by FMS.

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TABLES

Table 1

Timetable of Measures

Construct	**Instrument**	**Time of Administration**
Axis II eligibility Screener	IOWA Personality Disorder Screen	Screening
Functioning eligibility Screener	FIQ	Screening
Physical Functioning	FIQ	Screening, Postintervention
Demographics	Project Questionnaire	Baseline
Pain	VAS	Baseline, Postintervention
Emotional Functioning	PHQ	Baseline, Postintervention
Pain Acceptance	CPAQ	Baseline, Postintervention
Self-enmeshment with pain	PRISM	1st and last session of intervention
Self-concept	TST	1st session of intervention

Table 2

Demographic Characteristics of Patients

Variable	Means (SD)/ Frequencies (n = 28)
Age of participants	48.63 (12.96)
Average current pain	6.64 (2.02)
Average pain over past week	7.21 (2.22)
Race/Ethnicity	
White Non-Hispanic	79.3%
Black	17.3%
Other	3.4%
Education	
High School Graduate or less	18.5%
Technical/Trade School/Some College	44.4%
College Graduate or more	25.9%
Completed Post Graduate	11.1%
Employment Status	
Employed	40.7%
Unemployed	7.4%
Retired	11.1%
Disabled	29.7%
Other	11.1%
Annual Household Income	
Below 10K	14.8%
10-30	22.2%
30K	22.2%
40K	7.4%
50K	7.4%
60 K	11.1%
>70K	14.8%
Marital Status	
Married/Partnered	51.9%
Divorced	22.2%
Single	25.9%

Table 3

Demographic Characteristics of Participants by Treatment Group

Variable	ACT (n = 18) Means (SD)/ Frequencies %	Education (n = 10) Means (SD)/ Frequencies %	Group Comparisons	Effect Size
Age of participants	47.82 (12.91)	50.00 (13.62)	t(26) = 0.42, p = .68	d = 0.17
Current Pain	6.29 (2.32)	7.30 (1.16)	t(26) = 1.30, p =.21	d = 0.53
Average Pain	7.00 (2.40)	7.60 (1.90)	t(26) = 0.68, p = .50	d = 0.29
Race/Ethnicity				
White Non-Hispanic	77.8	80.0	$x^2 = (1, 27) = 0.45$, $p = 0.83$	$\phi = 0.04$
Non-white	22.2	20.0		
Education				
Less than 4 years of college	66.7	60.0	$x^2 = (1,27) = 0.06$, $p = 0.81$	$\phi = 0.05$
College Degree	33.3	40.0		
Employment Status				
Employed	38.9	40.0	$x^2 = (1,27) = 0.00$ $p = 0.95$	$\phi= 0.01$
Not employed	61.1	60.0		
Annual Household Income				
> 40K	61.1	60.0	$x^2 = (1,27) = 0.00$, $p = 0.95$	$\phi= 0.01$
< 40K	38.9	40.0		
Marital Status			$x^2 = (1, 27) = 0.89$, $p = 0.35$	$\phi= 0.18$
Married/Partnered	61.1	40.0		
Not partnered	38.9	60.0		

Table 4

Baseline Group Comparisons on Variables of Interest (t-test)

	ACT		**ED**		**Levene's Test**		**Test for equality of means**			**Effect Size**
	M	**SD**	**M**	**SD**	**F**	**p**	**T**	**Df**	**P**	**D**
PRISM FMS	5.56	6.38	2.65	3.17	3.29	0.08	0.92	22	0.24	0.38
PRISM Pain	4.89	6.08	3.51	3.94	0.65	0.43	0.58	22	0.57	0.24
PRISM Fatigue	4.05	4.29	3.74	4.43	0.21	0.65	0.17	22	0.87	0.07
PRISM Fibrofog	4.90	4.08	5.45	4.05	0.17	0.69	0.31	22	0.76	0.13
CPAQ-AE	35.83	17.09	30.20	11.98	0.58	0.46	0.92	26	0.37	0.38
CPAQ-PW	22.39	11.00	25.40	10.79	0.08	0.81	0.70	26	0.50	0.29

Table 5

Means and Descriptive Analysis Pre and Post-Intervention

	Baseline M	Baseline SD	Post M	Post SD
ACT				
Pain (VAS)	5.95	2.34	5.00	2.10
Fatigue (BFI)	5.84	1.96	4.72	2.02
PRISM FMS	5.56	6.38	6.31	3.17
PRISM Pain	4.89	6.08	5.58	3.31
PRISM Fatigue	4.05	4.29	7.36	4.76
PRISM Fog	4.90	4.05	9.92	6.30
CPAQ AE	35.83	17.05	47.22	11.03
CPAQ PW	22.39	11.00	30.22	10.75
Educational				
Pain (VAS)	6.89	1.93	6.91	2.03
Fatigue (BFI)	6.81	1.17	6.57	1.78
PRISM FMS	2.65	3.17	3.14	2.35
PRISM Pain	3.51	3.94	3.38	2.69
PRISM Fatigue	3.74	4.43	3.11	2.77
PRISM Fog	5.45	4.05	3.95	2.25
CPAQ AE	30.20	11.98	33.50	14.62
CPAQ PW	25.40	10.79	24.90	11.15

Table 6

Baseline Correlations Between the PRISM and CPAQ

	CPAQ Pain Willingness	CPAQ Activity Engagement	PRISM FMS SIS	PRISM pain SIS	PRISM fatigue SIS	PRISM Fog SIS
CPAQ Pain Willingness	1.00					
CPAQ Activity Engagement	0.63^{**}	1.00				
PRISM FMS SIS	0.46^{*}	0.56^{**}	1.00			
PRISM pain SIS	0.37	0.48^{*}	0.82^{**}	1.00		
PRISM fatigue SIS	0.25	0.42^{*}	0.75^{**}	0.68^{**}	1.00	
PRISM Fog SIS	0.25	0.175	0.36	0.19	0.37	1.00

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 7

ANCOVA Results, Controlling for Baseline Scores

	F	Df	P	Partial η^2
Pain (VAS)	3.88	(1, 28)	0.06	0.13
Fatigue (BFI)	3.96	(1, 28)	0.06	0.14
CPAQ PW	4.22*	(1, 28)	0.05	0.14
CPAQ AE†	5.60*	(1, 22)	0.03	0.23
PRISM FMS	4.88*	(1, 24)	0.04	0.19
PRISM Pain	2.30	(1, 24)	0.14	0.01
PRISM Fatigue	7.33**	(1, 24)	0.01	0.26
PRISM fog	8.41**	(1, 24)	0.01	0.29

*Significant at $\alpha < 0.05$
**Significant at $\alpha < 0.01$
†Analysis was conducted using unaltered dataset as the intent-to-treat dataset did not meet statistical assumption

Table 8

Mediation Results

```
VARIABLES IN THE FULL MODEL:

  Y = PRISM_FM
 M1 = CPAQ_AE_
  X = Group
=================================================================
OUTCOME VARIABLE:
 CPAQ-AE

MODEL SUMMARY

 ------------------------------------------------------------
  R         R-sq       Adj      F         df1       df2        p
                       R-sq
 ------------------------------------------------------------
  .3517     .1237      .0838    3.1047    1.0000    22.0000    .0920


 MODEL COEFFICIENTS
              Coeff.       s.e.        t          P

 Constant    -30.5000    11.8213    -2.5801     .0171
 Group         8.7500     4.9659     1.7620     .0920

 =================================================================
OUTCOME VARIABLE:
 PRISM SIS FMS

MODEL SUMMARY

 ------------------------------------------------------------
  R         R-sq       Adj      F         df1       df2        p
                       R-sq
 ------------------------------------------------------------
  .4634     .2148      .1400    2.8717    2.0000    21.0000    .0790
MODEL COEFFICIENTS
                 Coeff.       s.e.        T          p
Constant         5.8933      6.2297      .9460      .3549
CPAQ-AE           .2356       .0984     2.3937      .0261

Group            1.7931      2.4494     -.7321      .4722
=================================================================
INDIRECT EFFECT(S) THROUGH:
 CPAQ-AE
             Effect     SE(boot)     LLCI      ULCI

Group        2.0619      1.4460      .0067     5.4052
```

Table 9

Comparison of Correlations Pre and Post-intervention for ACT Group

	CPAQ Pain Willingness	CPAQ Activity Engagement	PRISM FMS SIS	PRISM pain SIS	PRISM fatigue SIS	PRISM Fog SIS
Baseline						
CPAQ Pain Willingness	1.00					
CPAQ Activity Engagement Scale	0.66**	1.00				
PRISM FMS SIS	0.57*	0.563*	1.00			
PRISM pain SIS	0.34	0.460	0.67**	1.00		
PRISM fatigue SIS	0.35	0.387	0.73**	0.71**	1.00	
PRISM Fog SIS	0.45	0.321	0.55*	0.30	0.42	1.00
Post-intervention						
CPAQ Pain Willingness	1.00	0.41	0.10	0.28	0.12	0.14
CPAQ Activity Engagement Scale		1.00	0.18	0.41	0.40	0.40
PRISM FMS SIS			1.00	0.51*	0.28	0.24
PRISM pain SIS				1.00	0.16	0.01
PRISM fatigue SIS					1.00	0.59*
PRISM Fog SIS						1.00

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table 10

Comparison of Correlations Pre and Post-intervention for Education Group

	CPAQ Pain Willingness	CPAQ Activity Engagement	PRISM FMS SIS	PRISM pain SIS	PRISM fatigue SIS	PRISM Fog SIS
Baseline						
CPAQ Pain Willingness	1.00					
CPAQ Activity Engagement Scale	0.74*	1.00				
PRISM FMS SIS	0.38	0.70	1.00			
PRISM pain SIS	0.40	0.55	0.83*	1.00		
PRISM fatigue SIS	0.07	0.63	0.85**	0.49	1.00	
PRISM Fog SIS	-0.24	-0.37	0.31	0.25	0.29	1.00
Post-intervention						
CPAQ Pain Willingness	1.00	0.79**	0.21	-0.00	-0.02	-.083*
CPAQ Activity Engagement Scale		1.00	0.75*	0.61	0.58	-0.62
PRISM FMS SIS			1.00	0.93**	0.83*	-0.07
PRISM pain SIS				1.00	0.87**	0.17
PRISM fatigue SIS					1.00	0.26
PRISM Fog SIS						1.00

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

FIGURES

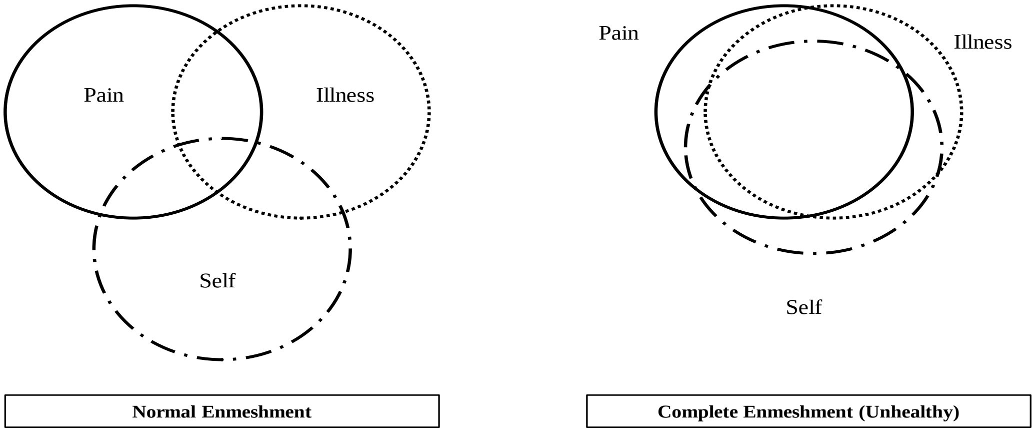


Figure 1. Enmeshment of Pain, Illness, and Self Schemas (adapted from Pincus and Morley, 2001)

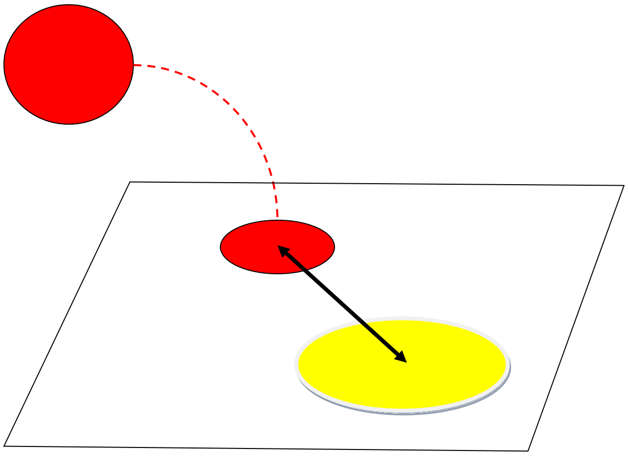
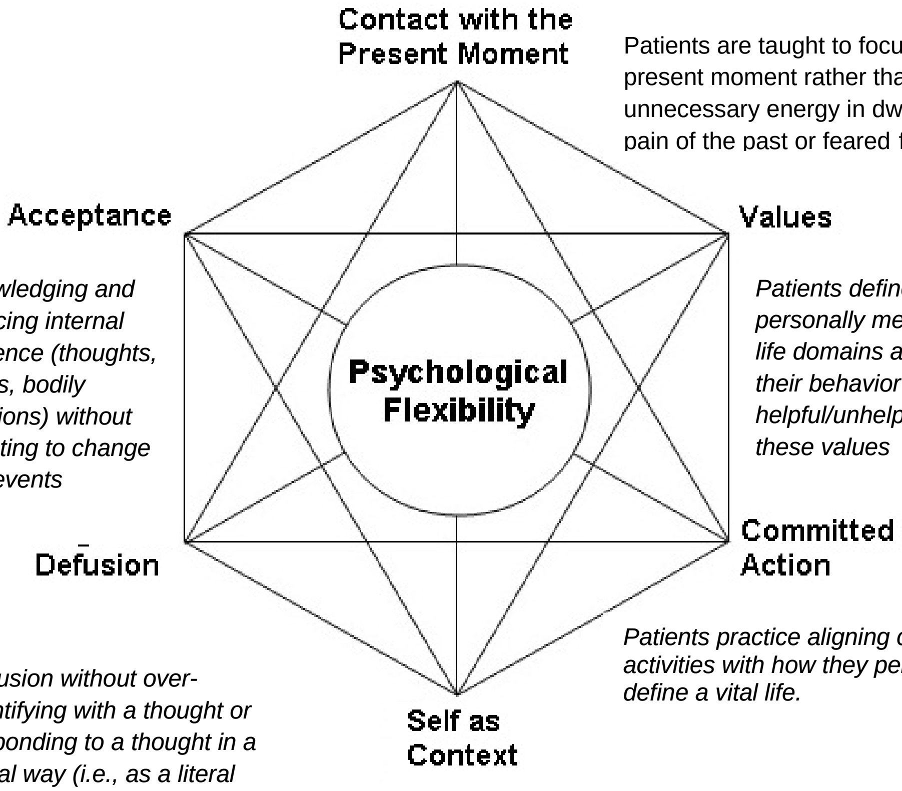


Figure 2. The PRISM



Patients are taught to focus on the present moment rather than investing unnecessary energy in dwelling on the pain of the past or feared future.

Acknowledging and embracing internal experience (thoughts, feelings, bodily sensations) without attempting to change these events

Patients define what is personally meaningful in key life domains and evaluate their behavior as helpful/unhelpful in terms of these values

Patients practice aligning current activities with how they personally define a vital life.

Defusion without over-identifying with a thought or responding to a thought in a literal way (i.e., as a literal truth). exercises separate words from the events they represent; allows patients to cognitively distance from deeply held beliefs about pain and self as defined by pain). This permits patients to recognize compelling thoughts as verbal constructions of the world

Patients experience the self as a stable perspective from which ever-changing events (such as thoughts and feelings that are constantly changing) can be observed

Figure 3. Hexaflex (adapted from Hayes et al, 1999). Descriptions of ACT tenets adapted with permission of Rhonda Merwin, Ph.D.

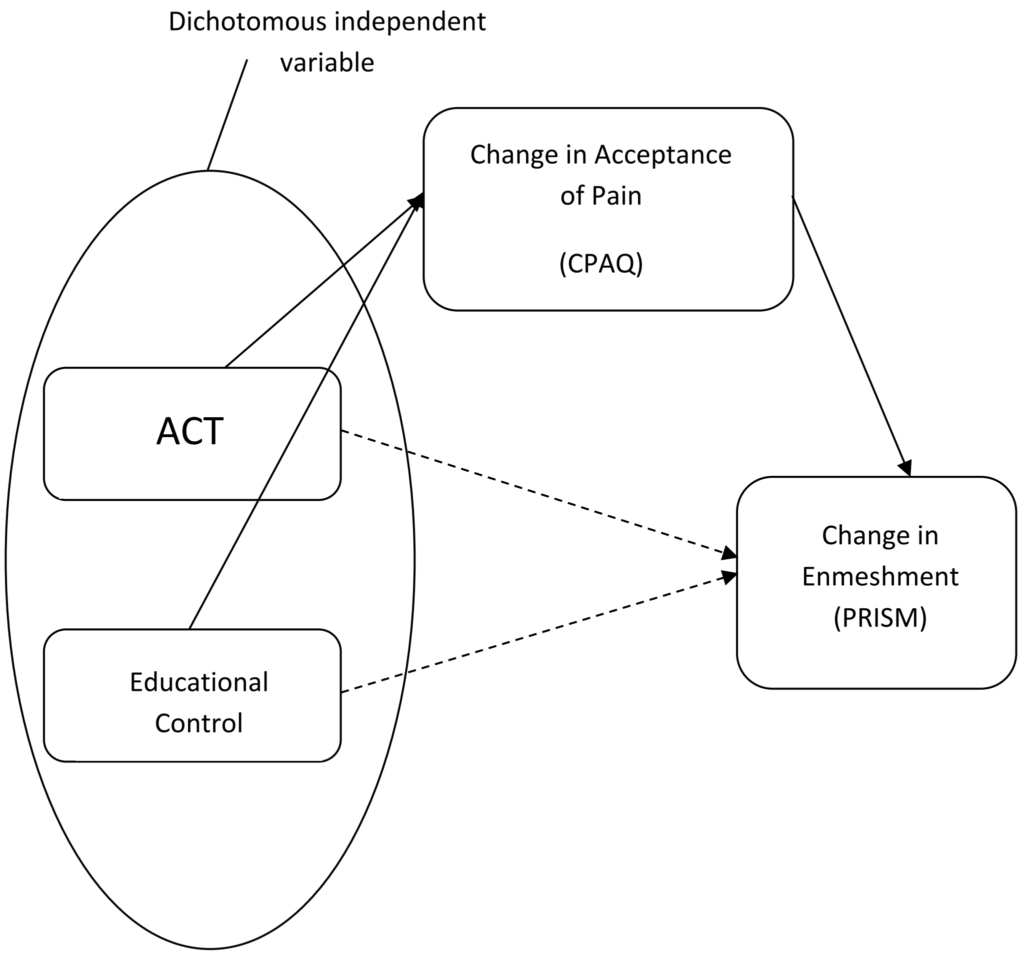


Figure 4. Hypothesized Mediation Model

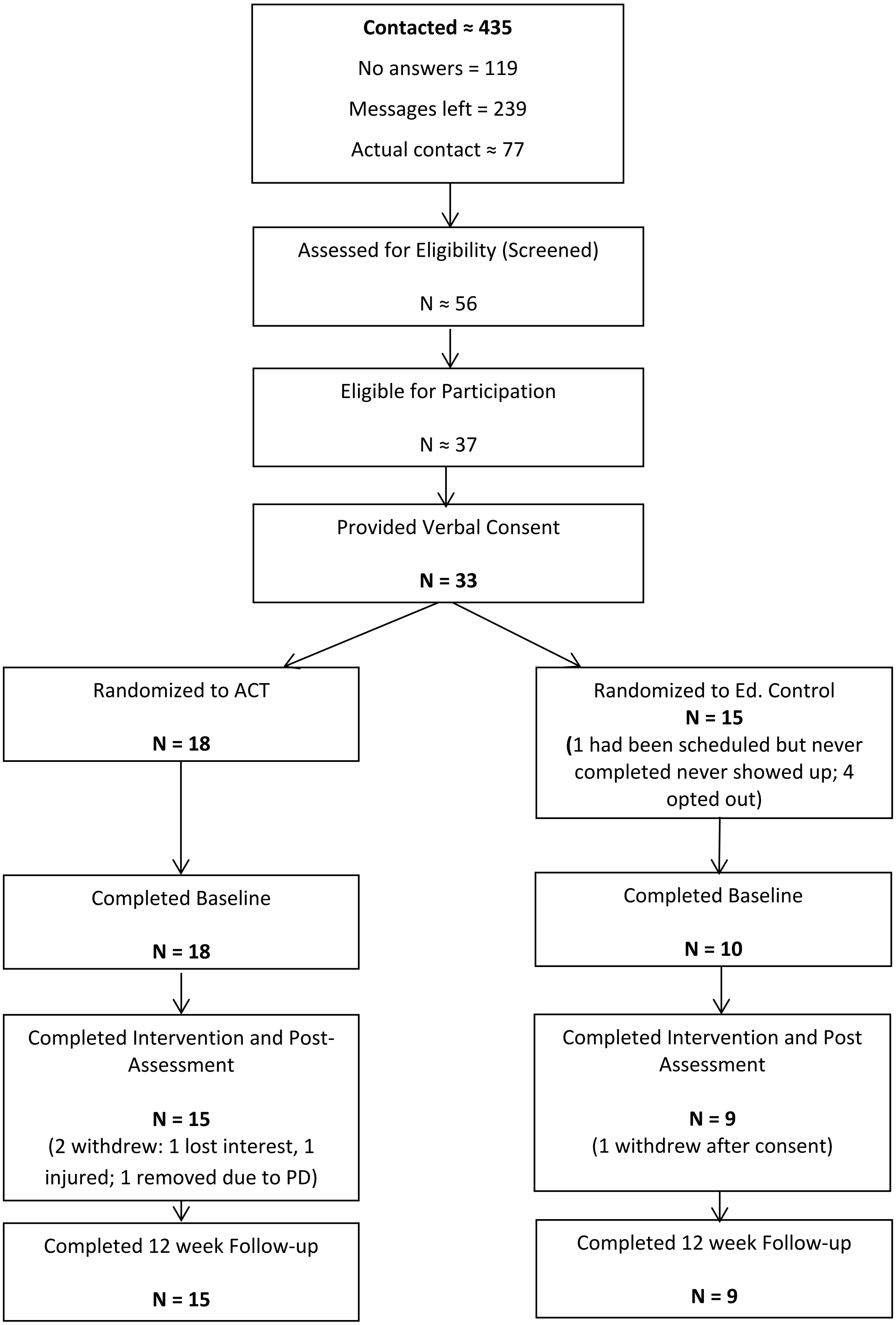


Figure 5. CONSORT Chart

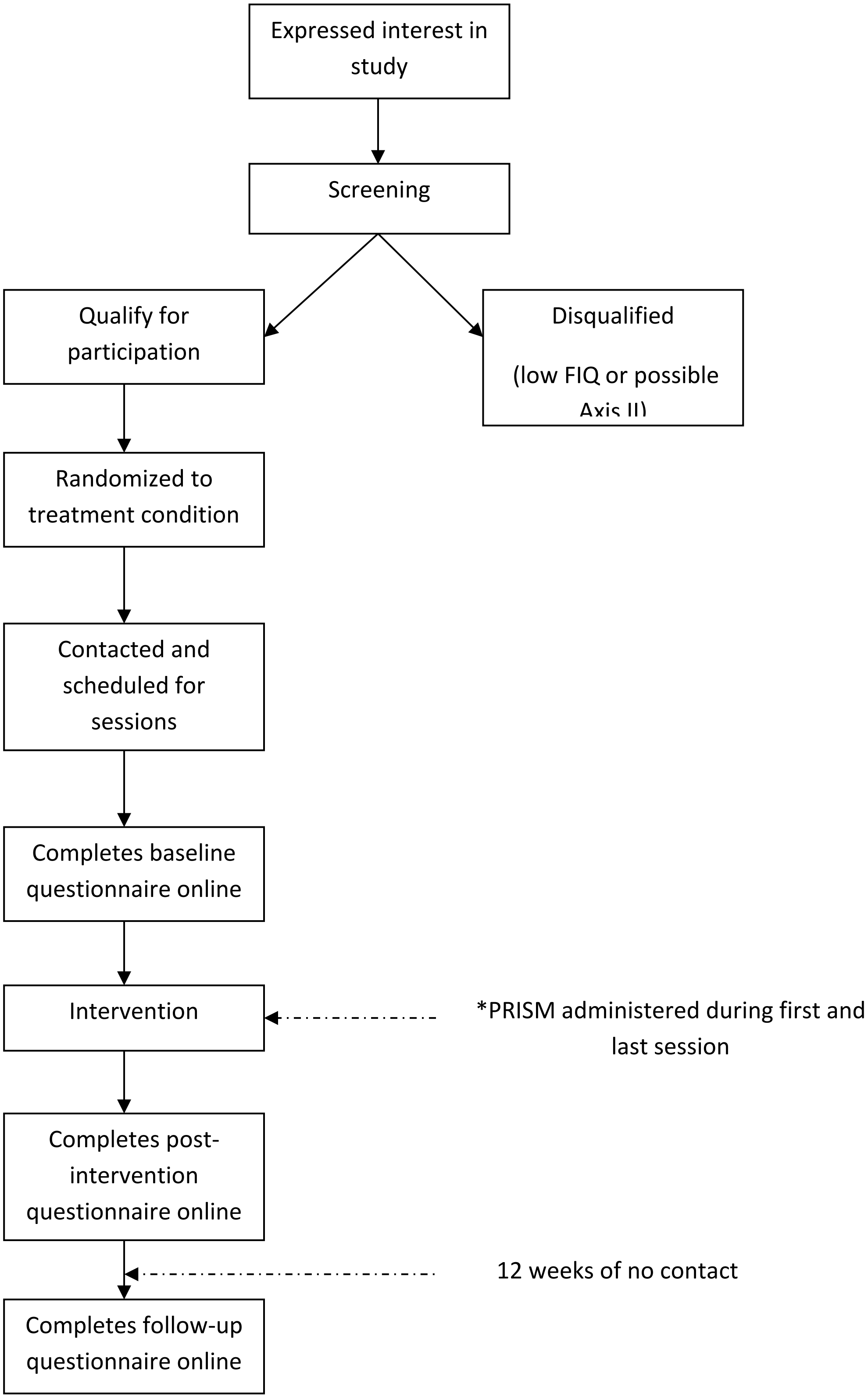


Figure.6 Flow Chart of Study Protocol

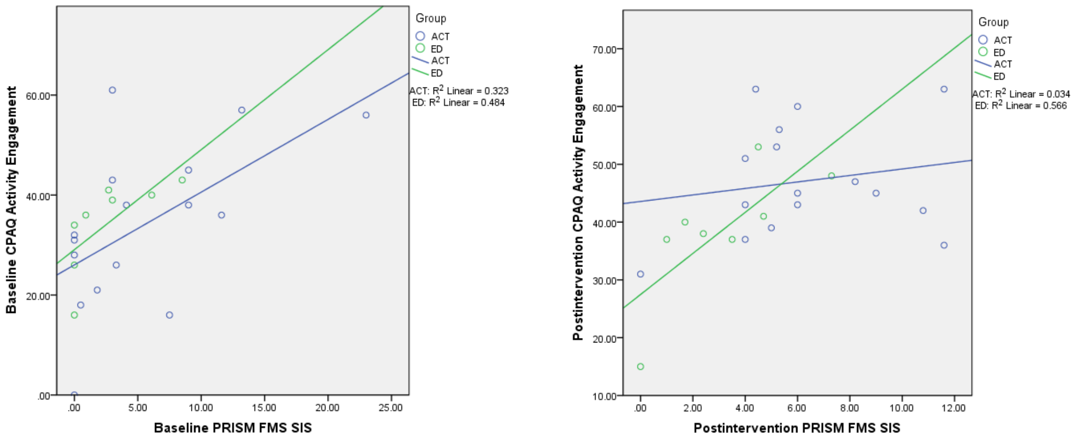


Figure 7. Change in the Relationship Between CPAQ-Activity Engagement and PRISM FMS by Group

APPENDICES

Appendix A

Script for Recruitment Calls for Participants Off FMS Registry

Hello XXX, My name is (Silvia Bigatti, Jennifer Steiner) and I am calling you from the Indiana University School of Medicine to invite you to be part of a study for fibromyalgia patients. You are specifically being called because you (have asked to be added to the Rheumatology Research List/have responded to advertisements regarding this study). Do you have time right now to hear about our study and decide whether you would like to participate? (If not, schedule a call back time). If yes: This is a study being conducted by Silvia Bigatti, who is in the Department of Public Health and a team of researchers who would like to determine whether an intervention we have designed is useful for fibromyalgia. If you agree to be part of the study, you will be expected to complete a battery of questionnaires before therapy, immediately after therapy, and again 3 months later. The surveys can be completed in person or online, whatever you prefer. Also, you will be expected to attend weekly individual sessions in our offices for 8 weeks. These sessions will last from 45-60 minutes and will be scheduled at your convenience. You would have to agree to be randomly assigned to one of two types of interventions, and once assigned randomly, you cannot be move into the other group. In order to participate, you would have to agree to this random assignment. Are you able to do all this? (If no, thank them and hang up).

If so: Now I am going to send you a brief questionnaire to complete online to see if you can be a part of the study.[if the person indicates they do not have internet access then offer to complete the eligibility screening on the phone. With permission proceed to below]

****If completing on the phone First of all, has your fibromyalgia been diagnosed by a physician? (If no, tell her we can't include her, thank her, and hang up). If so: Do you remember who it was and what month and year? Also, are you willing to stay on the same medications and doses for any antidepressants you are taking? (If no….) If yes: Are you able to read and write in English?; Are you between 18 and 65 years of age? Do you have other rheumatic conditions? Which? Have you been diagnosed with schizophrenia or other psychosis? Have you been diagnosed with cognitive impairments or dementia? (If no to all this, continue)***

I would like to administer a questionnaire to you at this point to see how the fibromyalgia is impacting your daily life. I will ask you a few questions and let you follow up with the answers…(administer the FIQ).

I would also like to ask you a few questions about how you are in everyday life (administer IOWA PD Screener)

In the end, let participants know whether they are eligible or not and ask them, if eligible, whether they prefer hard-copy or online completion of surveys.

If not eligible: "Unfortunately we cannot include you in the study, because of this we will remove all identifying information from the questions we just asked you, so you do not need to worry about loss of confidentiality. We will make a note that you didn't qualify, that way we do not contact you again. Thank you for your time and interest in the study."

Appendix B

Brief Fatigue Inventory (BFI)

Through our lives, most of us have times when we feel very tired or fatigued. Have you felt unusually tired or fatigued in the last week? **Yes**________ **No**_________

Please rate your fatigue (weariness, tiredness) by circling the one number that describes:

1) Your fatigue right now

0 1 2 3 4 5 6 7 8 9 10
No As bad as
Fatigue you can
imagine

---

2) Your USUAL level of fatigue during the past **24 hours**

0 1 2 3 4 5 6 7 8 9 10
No As bad as
Fatigue you can
imagine

---

3) Your WORST level of fatigue during the past **24 hours**

0 1 2 3 4 5 6 7 8 9 10
No As bad as
Fatigue you can
imagine

---

4) Circle the one number that describes how, during the past **24 hours**, fatigue has interfered with your:

a. General Activity
0 1 2 3 4 5 6 7 8 9 10
Does not interfere Completely
Interferes

b. Mood
0 1 2 3 4 5 6 7 8 9 10
Does not interfere Completely
Interferes

c. Walking ability
0 1 2 3 4 5 6 7 8 9 10
Does not interfere Completely
Interferes

d. Normal work (includes both work outside the home and daily chores)
0 1 2 3 4 5 6 7 8 9 10
Does not interfere Completely
Interferes

e. Relations with other people
0 1 2 3 4 5 6 7 8 9 10
Does not interfere Completely
Interferes

f. Enjoyment of life
0 1 2 3 4 5 6 7 8 9 10
Does not interfere Completely
Interfere

Appendix C

Scripted Instructions for the PRISM (adapted from Buchi and Sensky, 1999)

We would like to understand better how your Fibromyalgia affects your life at the moment. I'd like you to imagine that this white board represents your life as it is now.

The yellow disk in the bottom right corner represents your "self," and this red disk represents your Fibromyalgia.

Where would you put your Fibromyalgia—the red disk—in your life at the moment? [Hand red disk to patient]

Most people have an intuitive idea of where to place the illness disk, but if someone does not appear to understand the above instructions, go to those below:

As this may be a rather unusual way of showing the place of your illness in your life, let me give you another example. The blue disk represents your work or your job. For some people, work is an essential part of their lives and makes all the difference in how they see themselves. Such a person would put the "Work" disk on top of the "Self" disk [demonstrate this]. For other people, work is not that important. For example, they may work just to earn money. Such a person would place the "Work" disk quite far from the "Self" disk [demonstrate].

Where would you put your **Fibromyalgia**—the red disk—in your life in relation to yourself at the moment ? [Hand red disk to patient]

Measure the distance between the centers of the two disks—the Self-Illness Separation (SIS)using the ruler provided. Record this distance in centimeters on the PRISM record form.

Repeat the process for each of these aspects of the disease:

Green disk: Where would you put your **pain**—the green disk—in your life in relation to yourself at the moment? [Hand green disk to patient]

Orange disk: Where would you put your **fatigue**—the orange disk—in your life in relation to yourself at the moment? [Hand orange disk to patient]

Purple disk: Where would you put your **"fibro fog"** (memory problems, feeling like mind is "fuzzy")—the purple disk—in your life in relation to yourself at the moment? [Hand purple disk to patient]

Any other disk: Now I'd like you to pick any other part of your Fibromyalgia that plays an important role in your life and make it this disk [Hand disk to patient] Where would you put this in your life in relation to yourself at the moment?

Appendix D

Fibromyalgia Impact Questionnaire (Burckhardt, Clark, and Bennett, 1991)

1. Please mark the category on the scale that best describes how often you were able to engage in th activities listed over the past week:

Were you able to:

		Always	Most Times	Occasionally	Neve
a.	Do shopping	0	1	2	3
b.	Do laundry with a washer & dryer	0	1	2	3
c.	Prepare meals	0	1	2	3
d.	Wash dishes/cooking utensils by hand	0	1	2	3
e.	Vacuum a rug	0	1	2	3
f.	Make beds	0	1	2	3
g.	Walk several blocks	0	1	2	3
h.	Visit friends or relatives	0	1	2	3
i.	Do yard work	0	1	2	3
j.	Drive a car	0	1	2	3

2. Of the 7 days in the past week, how many days did you feel good?

1 2 3 4 5 6 7

3. How many days in the past week did you miss work because of your fibromyalgia?

0 1 2 3 4 5 I don’t work outside the home

For the following questions, please mark the point on the line that best describes your feelings for the past week:

4. When you did go to work, how much did pain or other symptoms of your fibromyalgia interfere with your ability to do your job?

0____10

No problem Great difficulty

5. How bad has your pain been?

0____10

No pain Very severe pain

6. How tired have you been?

0____10

No tiredness Very tired

7. How have you felt when you got up in the morning?

0____10

Awoke well rested Awoke very tired

8. How bad has your stiffness been?

0____10

No stiffness Very stiff

9. How tense, nervous or anxious have you felt?

0____10

Not tense Very tense

10. How depressed or blue have you felt?

0____10

Not depressed Very depressed

Scoring Instructions:

- Item 1: Average the 10 scores from the items listed as Item 1
  A+B+C+D+E+F+G+H+I+J/10 ______ +
- Item 2: Reverse score (if 3, write 5) ______ +
- Item 3: Copy score from above (if 3, write 3) ______ +
- Add scores from Items 4-10 _______+
- Add each of these steps for Total Score

= _____

Appendix E

Chronic Pain Acceptance Questionnaire (McCraken, Vowles, & Eccelston, 2004)

INSTRUCTIONS: Below you will find a list of statements. Please rate the truth of each statement as it applies to you. Use the following rating scale to make your choices. For instance, if you believe a statement is ‘Always True,’ you would write a 6 in the blank next to that statement

Never True	**Very Rarely True**	**Seldom True**	**Sometimes true**	**Often true**	**Almost always true**	**Always true**
0	1	2	3	4	5	6

1. I am getting on with the business of living no matter what my level of pain is ………
2. My life is going well, even though I have chronic pain………
3. It’s OK to experience pain ………
4. I would gladly sacrifice important things in my life to control this pain better ………
5. It’s not necessary for me to control my pain in order to handle my life well ………
6. Although things have changed, I am living a normal life despite my chronic pain ………
7. I need to concentrate on getting rid of my pain ………
8. There are many activities I do when I feel pain ………
9. I lead a full life even though I have chronic pain………
10. Controlling pain is less important than any other goals in my life ………
11. My thoughts and feelings about pain must change before I can take important steps in my life
12. Despite the pain, I am now sticking to a certain course in my life ………
13. Keeping my pain level under control takes first priority whenever I’m doing something
14. Before I can make any serious plans, I have to get some control over my pain ………
15. When my pain increases, I can still take care of my responsibilities ………
16. I will have better control over my life if I can control my negative thoughts about pain
17. I avoid putting myself in situations where my pain might increase ………
18. My worries and fears about what pain will do to me are true ………
19. It’s a relief to realize that I don’t have to change my pain to get on with my life ………
20. I have to struggle to do things when I have pain………

Appendix F

The Twenty Statements Test (TST)

There are twenty numbered blanks on the page below. Please write twenty answers to the simple question "Who am I?" in the blanks. Just give twenty different answers to this question. Answer as if you were giving the answers to yourself, not to somebody else. Write the answers in the order that they occur to you.

I am:

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

11.

12.

13.

14.

15.

16.

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Jennifer Leah Steiner

Educational History

Doctor of Philosophy in Psychology Indiana University-Purdue University Indianapolis Department of Psychology, Clinical Psychology Program (APA accredited)	2013

Title: *Assessing the Efficacy of Acceptance and Commitment Therapy in Reducing Schema-enmeshment in Fibromyalgia Syndrome*

Preliminary Exam Systematic Review Indiana University-Purdue University Indianapolis Department of Psychology, Clinical Psychology Program (APA accredited)	2011

Title: *An Examination of Pain-related Information Processing Biases in Chronic Pain Patients and their role in the Schema-enmeshment Model of Pain*

Masters of Science in Psychology Indianapolis University-Purdue University Indianapolis Department of Psychology, Clinical Psychology Program (APA accredited)	2010

Title: *The Utility of the Implicit Association Test in the Measurement of Pain and Self-Schema Enmeshment in Fibromyalgia Patients.*

B.A. in Psychology University of Maryland, College of Behavioral and Social Sciences B.A. in Dance University of Maryland, College of Arts and Humanities	2008

Academic Awards and Honors

Department of Psychology Research Award, IUPUI	2012
School of Science Travel Fellowship, IUPUI	2010
School of Science Travel Fellowship, IUPUI	2009
Educational Enhancement Grant for Travel, IUPUI	2009

Professional Memberships

American Psychological Association, Student Affiliate	2008-present
Society of Behavioral Medicine	2008-present
Indiana Psychological Association	2010-2012

Research Experience

Project Manager 2011-2012
IU School of Public Health/IUPUI Department of Psychology
Indianapolis, IN
Acceptance and Commitment Therapy for Fibromyalgia Patients:
Feasibility and Preliminary Efficacy Study

- Designing and wrote a proposal for a pilot study of an Acceptance and Commitment Therapy (ACT) intervention for chronic pain
- Recruited all volunteers
- Responsible for all IRB related matters
- Collected data, organized follow-ups, managed the budget, analyzed data, and co-authored manuscripts
- My dissertation was based on data that was collected as part of this study

Assistant Research Coordinator 2008-2011
IU Clinical Research Center for Pain and Fibromyalgia
Indianapolis, IN

- Organized recruitment of study volunteers
- Administered electromyogram testing to elicit a nociceptive flexion reflex (NFR) in patients with Fibromyalgia as part of a pilot study which aimed to clarify the role of the CNS in Fibromyalgia Syndrome
- Served as part of an interdisciplinary team of investigators to analyze data, develop intervention materials, and write manuscripts

Research Assistant 2007-2008
University of Maryland
College Park, MD

- Assisted in conducting research studies using the psychometric high risk paradigm
- Administered several affective eliciting stimuli
- Observed clinical interviews with subjects for Axis-I and Axis-II disorders (SCID, IPDE),
- Recorded data using Teleforms
- Received rained in behavioral coding of facial displays of emotion using FACES
- Organized follow-up with subjects of a NIMH funded longitudinal study on schizophrenia

Peer- Reviewed Publications

Steiner, J.L., Bogusch, L., & Bigatti, S.M. (in press). The association of Acceptance and Commitment Therapy and success in life values in fibromyalgia. *Health Psychology Research.*

Dir, A., Coskupinar, A., **Steiner, J.L.,** & Cyders, M. (in press). Personality and social learning predictors of sexting: Development of the sexting behaviors scale and the sextpectancies measure. *Cyberpsychology, Behavior, and Social Networking*.

Ang, D.C., Jensen, M.P., **Steiner, J.L.,** Hilligoss, J., Graceley, R.M., & Saha, C. (2013). Combining cognitive behavioral therapy and milnacipran for fibromyalgia: A feasibility randomized-controlled trial. *The Clinical Journal of Pain.*

Bigatti, S.M., **Steiner, J.L.**, & Miller, K.D. (2012). The role of cognitive appraisals and coping in psychological distress in advanced breast cancer patients. *Stress and Health*, *28*(5), 355-361.

Bigatti, S.M., **Steiner, J.L.**, & Cronan, T.A. (2012). Rates of depression and anxiety in cancer patients: A review of cross-national findings. *Praxis Klinische Verhaltensmedizin und Rehabilitation (Practice of Clinical Behavior Medicine and Rehabilitation).*

Bigatti, S.M., **Steiner, J.L.**, Makinabakan, N. Hernandez, A.M., Johnston, E., & Storniolo, A.M. (2011). Matched and mismatched appraisals in patients with breast cancer and their partners: Implications for psychological distress. *Psycho-Oncology*. DOI: 10.1002/pon.2028

Bigatti, S.M., Brown, L.F., **Steiner, J.L.**, & Miller, K.D. (2011). Breast cancer in a wife: How husbands cope and how well it works. *Cancer Nursing*, 34(3), 193-201. DOI:10.1097/NCC.0b013e3181ef094c.

Bigatti, S.M., Wagner, C.D., Lydon, J.R., **Steiner, J.L.**, & Miller, K.D. (2011). Depression in husbands of breast cancer patients: Relations to coping and social support. *Supportive Cancer Care, 19*(4), 455-466. DOI 10.1007/s00520-010-0835-8.

Steiner, J.L., Hernandez, A.M., Lydon, J.R., Johnson, E., & Bigatti, S.M. (2010). Role strains and marital satisfaction in husbands of patients with fibromyalgia syndrome. *Family Systems and Health, 28*(3), 209-233.

Ang, D.C., Chakr, R., Mazzuca, S., France, C.R. **Steiner, J.L.**, & Stump, T. (2010). Cognitive-behavioral therapy attenuates nociceptive responding in patient with fibromyalgia: A pilot study. *Arthritis Care and Research, 62*(5), 618-623.

Manuscripts Under Review

Ang, D.C., Saha, C., **Steiner, J.L.**, Jensen, M.P., Graceley, R.M., & Hilligoss, J. (under review). Combining cognitive behavioral therapy and milnacipran for fibromyalgia: A feasibility randomized-controlled trial.

Steiner, J.L., Bigatti, S.M., & Ang, D.C. (under review). Trajectory of change in pain, depression, and physical functioning after physical activity adoption in fibromyalgia

Invited Publications

Bigatti, S.M. & **Steiner, J.L.** (in press). *Appraisal of Caregiving Scale*. In Encyclopedia of Quality of Life Research.

Paper and Symposium Presentations

Bigatti, S.M., **Steiner, J.L.**, & Cronan, T.C. (2011). *Worldwide rates of distress in cancer patients: A review*. Paper presented at the Conference on Cancer Across the Continuum sponsored by the Borchard Foundation, Missillac, France.

Bigatti, S.M., **Steiner, J.L.**, & Cronan, T.C. (2011). *Dying well*. Paper presented at the Conference on Cancer Across the Continuum sponsored by the Borchard Foundation, Missillac, France.

Steiner, J.L., Bigatti, S.M., Merwin, R.M., & McCracken, L.M. (2010). Acceptance and commitment therapy for fibromyalgia syndrome. In S. A. Johns (Chair), *Innovative acceptance-based approaches to the assessment, conceptualization, and treatment of complex medical and mental health problems*. Symposium conducted at the 44th Annual Convention of the Association for Behavioral and Cognitive Therapies, San Francisco, CA.

Wagner, C.D., **Steiner, J.L.**, Storniolo, A.M., & Bigatti, S.M. (2009). *Patients and spouse cognitions in advanced breast cancer: implications for treatment*. Paper presented at the annual 2009 conference of the International Psycho-Oncology Society.

Tallman, E.F., **Steiner, J.L.**, Bigatti, S.M. (2009). *Our illness: Husbands of fibromyalgia women report marital satisfaction and changes in sexual activity since the onset of chronic illness.* Paper presented at Transcending Boundaries in Sexuality Research: Bridging Disciplines & Communities. National Sexuality Resource Center, Indiana University Bloomington, April 27, 2009.

Poster Presentations

Bigatti, S.M., **Steiner, J.L.**, Merwin, R.M., & McCracken, L. (2013). *Acceptance and Commitment Therapy Improves Depression Symptoms in Fibromyalgia Syndrome*. Poster to be presented at the annual 2013 conference of the International Association for Women’s Mental Health, Lima Peru.

Ang, D.C., Jensen, M.P., **Steiner, J.L.**, Hilligoss, J., Gracely’ R., & Saha, C. (2012). *Cognitive Behavioral Therapy and Milnacipran in Combination Appears to Be More Efficacious Than Either Therapy Alone.* Poster session presented at the 2012 American College of Rheumatology/ARHP Annual Meeting, Washington, D.C.

Bigatti, S.M., **Steiner, J.L.**, Merwin, R.M., & McCracken, L. (2012). *Acceptance and commitment therapy for fibromyalgia syndrome.* Poster session presented at the annual International Congress of Behavioral Medicine, Budapest, Hungary.

Steiner, J.L., Bogusch, L., & Bigatti, S.M. (2012). *Success in living a valued life: Acceptance and commitment therapy for fibromyalgia.* Poster session presented at the annual IUPUI Research Day, Indianapolis, Indiana.

Steiner, J.L., & Bigatti, S.M. (2011). Schema-*enmeshment in chronic pain: When self and illness are one and the same.* Poster session presented at the annual 2011 APA convention, Washington, DC.

Steiner, J.L., & Bigatti, S.M. (2011). Pain *acceptance moderates the relationship between pain intensity and pain and self-schema enmeshment in fibromyalgia patients.* Poster session presented at the annual 2011 conference of the Society of Behavioral Medicine, Washington, DC.

Steiner, J.L., Ang, D.C., & Chakr, R. (2010). Anger, *catastrophizing and sensitivity to pain in fibromyalgia patients.* Poster session presented at the annual 2010 conference of the Society of Behavioral Medicine, Seattle, Washington.

Bayman, N., **Steiner, J.L.**, & Bigatti, S.M. (2010). Depressive *rumination in cancer patients and partners: Implications for mental health and adjustment to illness.* Poster session presented at the annual 2010 conference of the Society of Behavioral Medicine, Seattle, Washington.

Steiner, J.L., Tallman, E., Miller, K., & Bigatti, S.M. (2009). *Can escape avoidance be a good form of coping*?. Poster session presented at the annual 2009 conference of the Society of Behavioral Medicine, Montreal, Canada

Tallman, E., Bigatti, S.M., & **Steiner, J.L.** (2009). *Sexual activity and marital satisfaction in husbands of women with Fibromyalgia.* Poster session presented the annual 2009 conference of the Society of Behavioral Medicine, Montreal, Canada.

Teaching Experience

Instructor, IUPUI 8/2011-5/2012
Courses: Stress and Health
Psychology of Women
Introduction to Psychology as a Social Science

Graduate Teaching Assistant, IUPUI 8/2008-5/2009
Courses: Stress and Health
Introduction to Clinical Psychology
Capstone in Applied Psychology

Clinical Experience and Training

Predoctoral Internship 7/2012-7/2013
Salem Veteran Affairs Medical Center
Salem, VA

- APA-accredited internship that focused on developing generalist skills
- Major Rotation Clinical Experiences
    - *Behavioral Medicine/Integrated Primary Care*
    - *Outpatient Psychological Services*
    - *Substance Abuse Residential Rehabilitation Treatment Program and Substance Abuse Liaison Team*
- Minor Rotation Clinical Experiences
    - *Palliative Care*
    - *Chronic Medical Illness Management*
    - *Military Sexual Trauma*

Psychology Practicum 5/2011-11/2011
Indiana University Neuropsychology Clinic
Indianapolis, IN
Supervisor: Daniel Rexroth, Psy.D.

Psychology Practicum 1/2011-5/2011
LaRue Carter Memorial Hospital
BASE Unit (Borderline Personality Disorder Unit)
Indianapolis, IN
Supervisor: Dr. Joan Farrell, Ph.D.

Psychology Practicum 5/2010-12/2010
St. Vincent Hospital Primary Care Center
Family Medicine/Internal Medicine
Indianapolis, IN
Supervisor: Dr. Thomas Barbera, Ph.D.

Psychology Practicum 8/2009-12/2010
Telephone-based CBT for chronic pain with Fibromyalgia patients
IU Clinical Research Center for Pain
Indianapolis, IN
Supervisor: Dr. Mark Jensen, Ph.D.