PAIN ANXIETY AND ACCEPTANCE AS PREDICTORS OF SELF-REGULATORY RESPONSES TO EXERCISE AMONG ADULTS WITH ARTHRITIS

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ABSTRACT

Engaging in 150+ minutes of moderate to vigorous exercise is a recommended self-management strategy for arthritis. Considering the low levels of exercise among individuals with arthritis, national calls have been made for investigation of theory-based processes important for adherence. Self-regulation may be a key process important for persisting with exercise plans in the face of arthritis pain anxiety. The present study examined relationships based upon a known model (Fear Avoidance [FA] model) used to understand self-regulatory behavioral responses to pain anxiety – an unexamined relationship in the arthritis and exercise literature. Primary study purposes involved examination of predictors (pain, pain anxiety, and pain acceptance) of maladaptive and adaptive self-regulatory responses among adults with arthritis who exercise. The secondary purpose examined whether participants who met the recommended dose of exercise over a two-week period significantly differed in their pain cognitions and self-regulatory responses to pain anxiety compared to less active counterparts. Participants were 136 adults (M_{age} = 49.75 ± 13.88years) with self-reported medically-diagnosed arthritis. Online surveys of pain cognitions and demographics were completed at baseline, followed by self-reported exercise two weeks later. Hierarchical multiple regression analyses illustrated that: (a) pain anxiety was a significant, positive predictor of the use of maladaptive self- regulatory responses ($p < .001$) and (b) the interaction of pain anxiety x pain acceptance was a significant predictor of the adaptive self-regulatory responses relationship ($p < .05$). Follow-up analyses illustrated that pain acceptance was a moderator of the pain anxiety – adaptive self-regulatory responses relationship. Participants with higher pain acceptance used adaptive responses less frequently when anxiety was lower than participants with lower acceptance. When pain anxiety was higher, both higher and lower pain acceptance was associated with the more frequent use of adaptive self-regulatory responses. A MANOVA analysis illustrated that participants meeting the recommended exercise dose had significantly lower pain anxiety, higher pain acceptance, and used maladaptive self-regulatory responses less compared to the group not meeting the dose (p's $\leq .01$). Taken together, findings provide the first ever support for FA model predictions in the arthritis – exercise domain. The results of this observational study suggest a next step could be an extended longitudinal study design with multiple time periods of assessment (e.g., measures once a month over a six-month period). Observing the relationships over time would provide a better understanding of within-person changes in the psychosocial variables relative to exercise. Such

research would provide a profile of individuals' levels of anxiety, acceptance, and self-regulatory responses when they either decrease or completely avoid exercise and when they adhere. Obtaining a social cognitive profile of people at risk for exercise avoidance may be a useful tool in the future to identify those who are in need of intervention to deal with their pain anxiety.

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CHAPTER 1

INTRODUCTION

Arthritis is one of the most common chronic diseases, currently affecting 4.2 million Canadians (Public Health Agency of Canada [PHAC], 2010). With the increase in the aging population, 7 million Canadians are expected to have this chronic disease by 2023 (PHAC, 2010). Arthritis includes over 100 different conditions that affect the joints, surrounding tissues, and other connective tissue. Some of the most common forms are osteoarthritis and rheumatoid arthritis (PHAC, 2010). Physical symptoms include pain, joint stiffness, and fatigue, while examples of mental health impacts are anxiety, depression, and lower health-related quality of life (Centers for Disease Control and Prevention [CDC], 2010; Heuts et al., 2004; Murphy, Sacks, Brady, Hootman, & Chapman, 2012; PHAC, 2010).

Given the chronic nature of arthritis, self-management strategies are essential to alleviate symptoms and improve health. Leading public health agencies in Canada and in the United States recommend regular exercise as being an effective behavioral self-management strategy (CDC, 2010; PHAC, 2010; United States Department of Health and Human Services [USDHHS], 2008). Evidence-based recommendations for adults are to engage in at least 150 minutes per week of moderate to vigorous intensity exercise (CDC; PHAC, 2010). Unfortunately, up to 60% of people with arthritis do not adhere to the recommended level of exercise (PHAC, 2010).

1.1 Self-regulation

Identifying theory-based factors that are important for exercise adherence is needed. Given that exercise is a freely chosen (i.e., volitional) and motivated behavior, self-regulation of this behavior in concert with other aspects of daily life is important for adherence. Social cognitive theory (Bandura, 1986) contends that individuals' self-regulation is important for their adherence. Self-regulation involves peoples' capacity to exert control over their behavior, cognitions, and affect in order to achieve a desired goal (Baumeister, Heatherton, & Tice, 1994; Maddux & Gosselin, 2003; Solberg Nes, Roach, & Segerstrom, 2009). Successful self-regulation requires that people monitor themselves in relation to their behavioral goals/standards (e.g., plans to exercise on five days in a week), have sufficient motivation to exert effort, and have adequate self-regulatory capacity to achieve their plans in light of barriers they experience (Hofmann, Schmeichel, & Baddeley, 2012).

According to the strength model of self-regulation, the individual's capacity to self-regulate is limited (Baumeister, 2002; Baumeister & Heatherton, 1996; Baumeister et al., 1994; Muraven, Tice, & Baumeister, 1998; Solberg Nes et al., 2009). Since acts of volition draw upon this self-regulatory capacity, people's abilities to self-regulate other near future acts can be reduced (Muraven & Baumeister, 2000). Self-regulatory strength is depleted to a greater extent when tasks require more self-control, such as when individuals are faced with trying to overcome barriers that may arise to the successful conduct of their exercise plans.

When faced with barriers, individuals may either adapt or not adapt. In the former case, individuals continue to strive to meet their behavioral plans when they have sufficient self-regulatory capacity to use *adaptive responses* to overcome their barriers (i.e., self-regulatory success and exercise adherence; Hall et al., 2008). In the latter case, barrier(s) may deplete self-regulatory resources, reducing self-regulatory capacity for subsequent tasks, including exercise adherence (Baumeister & Heatherton, 1996; Hagger, Wood, Stiff, & Chatzisarantis, 2010). In such cases, individuals may use *maladaptive responses*, such as doing something other than exercise that is more enjoyable and demands less capacity (e.g., watch television; Riley & Robinson, 1997), thereby leading to self-regulatory failure (i.e., exercise non-adherence). Understanding factors that may be associated with people's use of adaptive and maladaptive self-regulatory responses, and whether such responses are associated with exercise adherence, is needed in the arthritis – exercise area, if individuals are to attain evidence-based benefits of exercise. In order to gain a perspective on what is known regarding self-regulatory research and exercise in arthritis, a brief review is instructive.

1.2 Arthritis – Exercise Research on Self-regulation

The majority of arthritis – exercise research on self-regulation has examined relationships between self-regulatory efficacy beliefs and exercise adherence. These efficacy beliefs involve peoples' confidence in their skills and abilities to self-regulate across different domains of performance needed for exercise adherence. Efficacy beliefs influence the amount of persistence, time, and effort people invest in their self-regulatory actions (Bandura, 1997). In the arthritis literature, arthritis self-efficacy is a prevalent measure, especially in the seminal work by Lorig and colleagues on outcomes of her Arthritis Self-Management Program (Lorig, Chastain, Ung, Shoor, & Holman, 1989; Lorig & Holman, 1993). The behavioral focus of arthritis self-efficacy is on people's functioning in daily activities (efficacy to do a task) and in coping with

arthritis symptoms (self-regulatory efficacy). Although health outcomes of Lorig's (1993) program appear to be associated with increases in arthritis self-efficacy, empirical tests of whether change in arthritis self-efficacy actually causes change in program outcomes have not been reported. Further, Bandura (1986; 1997) recommends specificity when measuring efficacy beliefs about adherence to the behavior being performed, which is not part of the arthritis self-efficacy scale. For example, no reference to duration or context of behavior exists, such as one month or to dose of exercise (e.g., adherence to meeting/not meeting the dose for disease management).

More recent work examines self-regulatory efficacy beliefs that are specific to exercise (e.g., Bandura, 2004; Culos-Reed & Brawley, 2003; Maddux & Gosselin, 2003). Culos-Reed and Brawley (2003) found that among adults with fibromyalgia, a type of arthritis, self-regulatory efficacy to goal set was a significant predictor of exercise over a month period. In a series of studies, Gyurcsik and colleagues (2009, 2011, 2013) found that among adult samples with self-reported, medically-diagnosed arthritis, self-regulatory efficacy beliefs to (a) overcome arthritis barriers, such as pain and joint stiffness, and (b) schedule and plan exercise were higher among those who met exercise dose recommendations (150+ minutes/week; PHAC, 2010) than those who did not. Gyurcsik et al. (2009) also investigated the adaptive strategies that participants used to deal with their arthritis barriers. Successful self-regulators, who met the recommended exercise dose, reported using a variety of adaptive strategies. The most frequently reported strategies included modifying planned exercise by reducing the time or type of exercise, using adjuvant responses, such as taking arthritis-related medication, and carrying out planned exercise regardless of barriers (i.e., often referred to as “just do it” [exercise]).

Although not framed as self-regulation, Wilcox, Der Ananian, and colleagues (Der Ananian et al., 2006a; 2006b; Wilcox et al., 2006) employed a focus group methodology to compare the ways that exercisers and non-exercisers felt arthritis affected their behavior. Across both groups, the most frequently reported arthritis barriers that made it difficult to exercise included pain, fatigue, lack of mobility, and fear of experiencing pain. However, exercisers compared to non-exercisers differed in their responses to these barriers. Exercisers typically reported adaptive responses revolving around changes to their planned exercise routine in regards to type (e.g., swimming instead of walking), frequency (e.g., decrease weekly frequency) and intensity (e.g., change from moderate to light intensity). In contrast, non-exercisers

employed maladaptive responses, which most often involved the stopping of exercise altogether. Conclusions were that exercisers had the skills to adapt their exercise based upon the current state of their arthritis and related barriers, whereas non-exercisers did not have these skills.

Taken together, findings suggest that self-regulatory adaptive and maladaptive responses are associated with exercise adherence. Given that no arthritis – exercise research has examined factors that predict the use of adaptive or maladaptive self-regulatory responses to barriers, such an investigation would be instructive. Doing so would contribute to the knowledge base on the specific factors that characterize self-regulatory responses, in part to inform future interventions to improve adherence in people with arthritis, as well as to describe and gain insight about self-regulatory failure. One barrier that is frequently reported among people with arthritis and that may be particularly challenging to self-regulation is arthritis pain. The next section considers the potential role of arthritis pain as a barrier to exercise adherence.

1.3 Arthritis Pain – A Barrier to Self-regulation and Exercise Adherence?

Arthritis pain has been one of the most frequently reported barriers to exercise in both qualitative research (e.g., Der Ananian et al., 2006a; 2006b; Hewlett et al., 2011; LaChapelle, Lavoie, & Boudreau, 2008; Wilcox et al., 2006) and quantitative research, (e.g., Brittain, Gyurcsik, McElroy, & Hillard, 2011; Gyurcsik, Brawley, Spink, Brittain, Fuller, & Chad, 2009; Lefebvre et al., 1999). However, what is perplexing is that when analyzed quantitatively, pain is rarely associated with levels of exercise (see review by Eyler, 2003; Gyurcsik et al., 2009; Gyurcsik, Brawley, Spink, Glazebrook, & Anderson, 2011; Gyurcsik, Brawley, Spink, & Sessford, 2013). Further, Focht and colleagues (2002) found that arthritis pain was no worse on days that adults exercised compared to non-exercise days. They suggested that pain may not have been at sufficiently intense levels to influence exercise, and pain of greater severity should be examined.

Based on this suggestion, Gyurcsik et al. (2013) examined adults who experienced an arthritis flare, conceptualized as more extreme arthritis symptoms, including pain (Bingham III et al., 2009). Groups who met exercise dose recommendations over a two-week period (150+ minutes/week; PHAC, 2010) were compared to those who did not meet the dose with respect to their self-regulatory efficacy beliefs, pain, and flare-related factors (i.e., total number of flares, average duration of flare, and average flare pain). The group who met the dose had significantly higher self-regulatory efficacy to overcome arthritis barriers and to schedule/plan exercise

compared to the group not meeting the dose. The two groups did not differ in their pain or flare-related factors. Findings suggest that arthritis pain may not limit people's exercise adherence as much as previously thought, even under conditions when pain is worse than normal (i.e., during an arthritis flare).

Looking to the larger chronic pain literature, researchers contend that social cognitive responses to pain, versus pain itself, may be determining factors in whether people engage in valued activities, like exercise (McCracken & Gutierrez, 2011; White et al., 2013). One particularly common response to pain among those with arthritis is pain anxiety (Der Ananian et al., 2006a; 2006b; Heuts et al., 2004; Murphy et al., 2012; PHAC, 2010; Wilcox et al., 2006). To understand how pain anxiety may impact whether people engage in valued activities, such as exercise, the fear avoidance model of pain may be helpful (Lethem, Slade, Troup, & Bentley, 1983; Crombez, Eccleston, Van Damme, Vlaeyen, & Karoly, 2012). The model will be reviewed next, including when people are expected to use adaptive or maladaptive self-regulatory responses.

1.4 Fear – Avoidance Model of Pain

The fear – avoidance (FA) model of pain was originally developed by Lethem and colleagues (1983) in the larger chronic pain domain. The model explains the behavioral avoidance of movements or activities based on pain fear and anxiety, leading to a downward spiral of future escape and avoidance (e.g., exercise non-adherence), disability, and pain (Vlaeyen & Linton, 2000). Escape and avoidance involves individuals completely bypassing/stopping a potentially aversive event that is anticipated to cause pain. Furthermore, fear and anxiety are theoretically distinct. Fear involves an immediate *reaction* to a specific painful activity/stimulus, such as an injury (Asmundson, Vlaeyen, & Crombez, 2004). The reaction to fear is immediate as individuals try to reduce pain by disengaging from the pain-producing activity/stimulus, or engaging in immediate behavioral modifications, such as limping or bracing the body (Asmundson et al., 2004). Because fear is present focused, it cannot by definition lead to future avoidance (i.e., a key outcome of the FA model; Asmundson et al., 2004; Leeuw et al., 2006).

In contrast, pain anxiety is a distinct future-oriented affective state involving anticipation of a threat, such as anticipated pain or injury, without requiring an objective stimulus/source (Asmundson et al., 2004; Carleton & Asmundson, 2009; Leeuw et al., 2006). Pain anxiety is

purported to be responsible for avoidance of a future event that is anticipated to cause pain (Asmundson et al., 2004). More specifically, when people anticipate the potential for pain to occur when doing future planned activities, which require self-regulation, they are more likely to avoid such activities. Given the potential importance that pain anxiety has in the self-regulation of behaviors, this psychological construct was the focus in the present research.

The FA model postulates that peoples' anxiety increases in response to their pain, leading to one of two behavioral response pathways: confrontation or avoidance. These two pathways influence whether individuals become trapped in the downward spiral of activity avoidance, disability, and pain (Slade, Troup, Lethem, & Bentley, 1983; Vlaeyen & Linton, 2000). Confrontation is an adaptive pathway and leads to continued participation in valued activities and eventual reduction or complete abolition of pain anxiety over time (Crombez et al., 2012; Esteve & Ramirez-Maestre, 2013; Leeuw et al., 2006). In contrast, avoidance, the maladaptive pathway, involves individuals' negative interpretation of their pain, which in turn, leads to increases in pain anxiety and avoidance behaviors (Vlaeyen, Kole-Snijders, Boeren, & van Eek, 1995). Factors that may determine the extent to which individuals confront or avoid their pain anxiety include stressful life events, personality characteristics, personal pain history, and personal coping strategies, including maladaptive or adaptive self-regulatory responses (Lethem et al., 1983; Slade et al., 1983).

1.5 FA Model – Avoidance and Maladaptive Self-regulatory Responses

Research in the larger chronic pain domain has supported relationships between pain anxiety and avoidance behaviors. Individuals with higher levels of pain anxiety were found to engage in avoidance behaviors more often, subsequently leading to increased physical limitations (e.g., Crombez et al., 2012; Turk & Okifuji, 2002; Waddell, Newton, Henderson, Somerville, & Main, 1993). From a self-regulatory strength perspective, pain anxiety may be a challenge that people with arthritis attend to, leading to hypervigilance (Crombez et al., 2012; Vlaeyen & Linton, 2000). Hypervigilant individuals attend to their pain and signals of future threats, at the expense of attending to other information in the environment. In turn, the focus on pain and threat may have the potential to reduce their subsequent capacity to self-regulate. If this is the case when deciding whether to engage in planned exercise, people may be more apt to engage in less costly self-regulation through maladaptive responses to their pain anxiety, such as stopping

their exercise or choosing to do a non-exercise activity with a friend (e.g., drinking coffee or watching TV).

Individuals, who can be observed as following the maladaptive (avoidance) pathway of the FA model, may be characterized as follows. People with higher anxiety should be less likely to adhere to exercise or other planned activities. Such inactivity may subsequently lead to the continued anticipation of pain due to exercise, and related anxiety about pain, thereby reinforcing the avoidance of exercise and perpetuating the avoidance cycle (e.g., Crombez et al., 2012; Leeuw et al., 2006; Vlaeyen & Linton, 2000). To be clear, pain itself is not what leads to disengagement from exercise/daily activities. Disengagement occurs due to peoples' reaction to their pain, one being their pain anxiety, and the use of maladaptive self-regulatory responses to that anxiety (e.g., Esteve & Ramirez-Maestre, 2013; McCracken, Spertus, Janeck, Sinclair, & Wetzel, 1999). Although the maladaptive pathway described in the FA model seems intuitive relative to avoidance of exercise, the relationship between pain anxiety and maladaptive self-regulatory responses has not been examined in the arthritis – exercise research.

1.6 FA Model – Confrontation and Adaptive Self-regulatory Responses

The second pathway in the FA model suggests that people confront their pain and anxiety by engaging in adaptive self-regulatory responses. These adaptive responses allow them to continue to engage in their planned activities (Crombez et al., 2012). Individuals who confront their anxiety may have pain resiliency, which, in part, is reflected by having higher pain acceptance (Crombez et al., 2012; Esteve et al., 2013). Pain acceptance is a known psychological construct that involves a willingness to engage in valued activities (e.g., exercise), without efforts to control pain (McCracken, Vowles, & Eccleston, 2004). Individuals who accept their pain do not actively try to control or reduce it, but seem to be able to decrease its impact on their functioning. This reduced impact appears to allow individuals higher in their pain acceptance to engage in their activities of daily living (Cho, McCracken, Heiby, Moon, & Lee, 2013; Crombez et al., 2012).

If pain acceptance is considered in light of the FA model, it may allow individuals to view their experiences of higher levels of anxiety as less threatening (Crombez et al., 2012), allowing individuals to effectively adapt (e.g., use adaptive self-regulatory responses). More specifically, Crombez and colleagues (2012) suggest that pain acceptance may allow individuals to stop their search for a cure to their pain and related outcomes, such as pain anxiety, and focus

instead on engaging in valued, goal-directed activities, like exercise. It follows that having higher levels of pain acceptance may allow individuals to respond to a challenge, such as higher pain anxiety, by using adaptive strategies to reach their exercise goal. In contrast, when anxiety is lower, it may be perceived as being less or not challenging due to higher acceptance, requiring minimal to no adaptation. Crombez and colleagues (2012) strongly support investigation of pain acceptance in the FA model. Thus, the present research investigated whether pain acceptance moderated the relationship between pain anxiety and adaptive responses.

Pain acceptance, on its own, has been studied in the arthritis – exercise domain and in the larger arthritis and chronic pain literature. Support for the differential relationship with both planned exercise and with pain anxiety has been demonstrated. Gyurcsik et al. (2011) examined adults with plans to exercise over a two-week period and found that participants who met the recommended dose of exercise (150+ minutes; PHAC, 2010) had higher levels of pain acceptance compared to those not meeting the dose. In the larger chronic pain domain, consistent negative relationships between pain acceptance and pain anxiety have been observed (e.g., LaChapelle et al., 2008; McCracken & Vowles, 2008).

1.7 Summary

Self-regulation is key to the performance of motivated behaviors, including exercise, as it allows individuals to persist to achieve planned activities in the face of challenges (Bandura, 1986; Baumeister et al., 1994; Hofmann et al., 2012). Among those with arthritis, pain anxiety may be one such challenge (Heuts et al., 2004). According to the FA model, individuals' experiences of pain anxiety may follow an adaptive pathway in which their anxiety is confronted. Confrontation may occur when pain is accepted and individuals' engage in adaptive self-regulation, in response to their higher pain anxiety levels. If this is the case, individuals would persist in their planned activities, like exercise. In contrast, avoidance may occur when people focus on their pain anxiety, reducing their subsequent capacity to self-regulate and use maladaptive responses, such as stopping their planned exercise.

Given the positive health benefits of adherence to 150+ minutes of moderate to vigorous exercise for individuals with arthritis (PHAC, 2010), understanding psychological factors related to the disease that may be associated with differential responses to engaging in exercise is important. Pain is a suggested deterrent to exercise reported by individuals with arthritis, yet it is rarely a strong predictor of future exercise. Investigating relationships between pain, pain

anxiety, pain acceptance, and self-regulatory responses important for whether individuals exercise may shed some light on why. The present study was conducted to examine relationships based upon a known model (FA model) used to understand responses to pain anxiety that have not previously been examined relative to arthritis and exercise.

1.8 Primary Purposes and Hypotheses

The study had two primary purposes, including the examination of predictors of maladaptive self-regulatory responses to pain anxiety(primary purpose 1) and adaptive self-regulatory responses to pain anxiety (primary purpose 2) among adults with medically-diagnosed arthritis who attempt to exercise.

Hypothesis 1 (predicting maladaptive self-regulatory responses): Based upon the FA model as well as findings in previous research, pain anxiety was expected to significantly predict maladaptive responses after controlling for arthritis pain (e.g., Leeuw et al., 2006; McCracken et al., 1999; Vlaeyen & Linton, 2000).

Hypothesis 2 (predicting adaptive self-regulatory responses): Based upon the FA model and previous research, pain acceptance was expected to moderate the relationship between pain anxiety and adaptive self-regulatory responses, after controlling for arthritis pain (e.g., Crombez et al., 2012; Gyurcsik et al., 2011; McCracken et al. 1999).

1.9 Secondary Purpose

Given the importance that adherence to the recommended dose of exercise has on arthritis self-management (PHAC, 2010), a secondary purpose was to examine whether participants who met the recommended dose of 150+ minutes per week of moderate to vigorous exercise over a two-week period significantly differed in their arthritis pain, pain anxiety, pain acceptance, and self-regulatory responses to pain anxiety compared to those not meeting the dose.

Hypothesis 3 (examination of differences in groups meeting/not meeting exercise dose): Based upon the FA model and past research on self-regulatory cognitions in the arthritis – exercise domain, those meeting the recommended dose were expected to have significantly lower pain anxiety, higher levels of pain acceptance, use adaptive strategies more often, and use maladaptive strategies less often than those not meeting the dose (e.g., Crombez et al., 2012; Gyurcsik et al., 2011; Hagger et al., 2010). Differences in arthritis pain were not expected as observed in prior research (Gyurcsik et al., 2013).

CHAPTER 2

METHODS

2.1 Participants

Participants were 136 adults with self-reported medically diagnosed arthritis. The mean age of the participants was 49.75 ± 13.88 years. As seen in Table 1, participants were predominantly female, white, and married. Nearly 50% of participants held a bachelor's degree or higher and 30% were employed full-time. Overall, based upon self-reported height and weight, the mean body mass index (BMI) was 28.18 ± 7.17 kg/m^2. The results section presents the clinical (i.e., arthritis) demographics of study participants.

Table 2.1

Demographics of Study Participants (N = 136)

Demographic	Category	*n (%)*
Gender	Female	116 (85%)
	Male	17 (13%)
Ethnicity	White	126 (93%)
	Chinese	3 (2%)
	Latin American	3 (2%)
	Native American	1 (1%)
	Multiracial	2 (1%)
Marital status	Married	77 (57%)
	Divorced	15 (11%)
	Widowed	2 (1%)
	Single	28 (21%)
	Not married, but living with partner	9 (7%)
	In a relationship, but not married or living with partner	5 (3%)
Education	No degree	2 (1%)
	High school graduate	17 (13%)
	Trades certificate	8 (6%)
	Community college	27 (20%)
	University certificate or diploma below bachelor's	13 (10%)
	Bachelor's degree	33 (24%)
	University certificate or degree above bachelor's	9 (7%)
	Medical degree	2 (1%)
	Master's degree	17 (13%)
	Earned doctorate	6 (4%)
Employment	Full-time	41 (30%)
	Part-time	11 (8%)
	Homemaker	8 (6%)
	Student	4 (3%)
	Retired	25 (18%)
	Disability	15 (11%)
	Self-employed	7 (5%)
	Out of work more than 1 year	3 (2%)
	Out of work less than 1 year	1 (1%)
	Combined-multiple	21 (15%)

Note. Full data on the 136 participants are not reported due to missing values for gender (n = 3), ethnicity (n = 1), and education (n = 2).

2.2 Measures and Study Design

The study design was observational and prospective, with two time-periods of measurement (baseline; time 2: two weeks after baseline). Appendix C contains all of the study measures.

2.2.1 *Demographics*. Demographic information included self-report of age, gender, ethnicity, marital status, level of education, and employment status. Self-report of anthropometric and disease characteristics were also obtained, including height and weight (used to calculate BMI), as well as arthritis-specific information about the number of years being medically-diagnosed with arthritis, limitation in activities due to arthritis, and current medication use for arthritis.

2.2.2 *Pain intensity*. Participants rated their arthritis pain in four instances: "during a typical day", "during a typical flare", "when not in a flare", and "at the present moment". Responses were on a 0 (*no pain*) to 10 (*extreme pain*) scale. A mean score was calculated for each participant and used in the analyses. The measure was used in previous arthritis – exercise research, demonstrating acceptable internal consistency (e.g., α's $\geq$ .89; Gyurcsik et al., 2009; 2011) and follows recommendations for assessing chronic pain (Hadjistavropoulos et al., 2007). The measure was internally consistent in the present study (α = .88; Field, 2005).

2.2.3 *Pain acceptance.* The Chronic Pain Acceptance Questionnaire (CPAQ) assessed arthritis pain acceptance in the present study (McCracken et al., 2004). The CPAQ is comprised of two subscales: (a) an 11-item activities engagement scale, which assesses the extent to which people pursue life activities despite having pain; and (b) a nine-item pain willingness scale that assesses people's willing to experience pain without any control attempts. In line with previous research (Gyurcsik et al., 2011), "arthritis" was inserted before "pain" in each item. This change was deemed necessary to encourage study participants to respond to acceptance of their arthritis pain versus other types they may have been experiencing at the time of responding (e.g., pain from an acute injury, headache pain, etc.). An example *activities engagement item* was: "I am getting on with the business of living no matter what my level of arthritis pain is" and an example *pain willingness item* was "I need to concentrate on getting rid of my arthritis pain". Participants rated the truth of each item on a 0 (*never true*) to 6 (*always true*) scale. As recommended by McCracken et al. (2004), a total pain acceptance score was calculated by first reverse scoring the pain willingness subscale items and then summing the items of both subscales. The total possible response range was 0–120, with higher scores representing greater pain acceptance.

The CPAQ is a reliable and valid measure (McCracken et al., 2004), has been used with other chronic disease samples attempting to adhere to exercise for disease management (e.g., peripheral artery disease: Rejeski, Tian, Liao, & McDermott, 2008), and was internally consistent in the present study ($\alpha = .90$; Field, 2005).

2.2.4 *Pain anxiety*. The Pain Anxiety Symptoms Scale (PASS-20) assessed arthritis-related pain anxiety (McCracken & Dhingra, 2002). The PASS-20 consists of four subscales with five items each: (a) cognitive anxiety symptoms; (b) escape/avoidance behaviors; (c) fearful responses to pain; and (d) physiological arousal in response to pain (Carleton & Asmundson, 2009; McCracken & Dhingra, 2002; Strahl, Kleinknecht, & Dinnel, 2000). "Arthritis" was inserted immediately before "pain" in each PASS-20 item to focus participants' responses about anxiety they could have been experiencing from their arthritis pain versus anxiety from other types of pain. Example items for each subscale included: "I can't think straight when in arthritis pain" (*cognitive anxiety*), "I avoid important activities when I hurt" (*escape/avoidance*), "Arthritis pain sensations are terrifying" (*fearful responses to pain*), and "When I sense arthritis pain, I feel dizzy or faint" (*physiological anxiety*). Participants were first instructed to think about when they have arthritis pain and were planning to do moderate to vigorous exercise during a typical week. With that focus in mind, they indicated the extent to which each PASS item was a true description of them on a 0 (*never*) to 5 (*always*) scale.

An overall pain anxiety score was calculated by summing items across all of the subscales (McCracken & Vowles, 2007; Roelofs et al., 2004). Scores range from 0 to 100, with higher scores representing more anxiety. A total score, versus subscale scores, was used in order to investigate the study purposes about overall pain-related anxiety predicting self-regulatory responses and differences in overall pain anxiety between participants meeting or not meeting recommended exercise levels (Abrams, Carleton, & Asmundson, 2007; Roelofs et al., 2004). The PASS-20 has established reliability and validity (McCracken & Dhingra, 2002) and was internally consistent in the present study ($\alpha = .93$).

2.2.5 *Adaptive and maladaptive self-regulatory responses to pain anxiety*. No measure of behavioral self-regulatory responses to pain anxiety existed. Thus, adaptive and maladaptive behavioral measures were developed. Items for each measure were identified from past arthritis, exercise, and chronic pain research that reported self-regulatory strategies to deal with pain (e.g., Crombez et al., 2012; Der Ananian et al., 2006a; Gyurcsik et al., 2009; Larsen, Taylor, &

Asmundson, 1997). Adaptive strategies were identified as those that aided participants to deal with/self-regulate their pain anxiety and continue to exercise. Maladaptive strategies were those that consisted of escape/avoidance self-regulatory responses among participants who were ineffective in exercising as planned in the face of anxiety.

Seven adaptive items were identified and used in the present study. Two examples were "Alternate the type of exercise that you planned on doing" and "Change the type of exercise you planned on doing". Five maladaptive items were identified for use in the present study. Example items were "You are overwhelmed and you stop doing your planned exercise", and "You do something else that you enjoy (like watch TV, go to a movie, shop, listen to music, etc.)". For all items, participants rated the extent to which they would implement each of the responses when experiencing pain anxiety and attempting to do their planned exercise over the following two weeks on a 0 (*never do this*) to 8 (*always do this*) scale.

Given these measures were newly developed, the internal consistency values of the adaptive and maladaptive measures were investigated before any study analyses to test hypotheses were undertaken. A Cronbach's alpha value of .60 or higher for the adaptive and maladaptive responses scales was acceptable. Nunnally (1978) recommended a value of .70 or higher when newly developed measures are being used. However, as pointed out by Clark and Watson (1995) and others (e.g., Field, 2005), a minimum Cronbach's alpha value of .60 has been deemed acceptable, with no clear minimum value being a gold standard. Given the variety of recommendations, a minimum alpha value of .60 was deemed acceptable in the present study. The decision was based upon the exploratory nature of the present study as well as accepted use of this minimum value. The longer-term view would be to continue to investigate and adapt, if needed, the measures as research progresses in the future.

The maladaptive measure, with the original five items, had acceptable internal consistency ($\alpha = .80$). For each participant, a total maladaptive self-regulatory responses to pain anxiety score was calculated by adding the scores of the five items together. Scores ranged from 0 to 40, with higher scores representing the use of more maladaptive responses.

The seven-item adaptive measure did not exhibit acceptable internally consistency ($\alpha = .43$). The following two steps were undertaken to improve the measure. First, as seen in Table 2.2, examination of the internal consistency values for the scale, when each item was iteratively removed, illustrated that removing item 2 (i.e., "Do all of your scheduled/planned exercise,

regardless of your pain anxiety") improved the internally consistency of the measure. This item was deleted from the adaptive measure. However, it was kept as a stand-alone item in the study analyses because doing planned exercise despite pain has been reported as a key strategy that helps people with arthritis self-regulate their barriers and adhere to exercise (e.g., Gyurcsik et al., 2009). This item was not an adaptation to pain anxiety but a maintenance of current behavior (i.e., exercise as planned). This *maintenance* self-regulatory response to pain anxiety was investigated in an exploratory manner. Considering the FA model and the potential of a maintenance self-regulatory response to help people confront their pain and anxiety, moderation of its relationship with adaptive self-regulatory responses by pain acceptance was investigated.

The second change in the adaptive measure was that item three (i.e., "take pain medication [e.g., ibuprofen, Tylenol, prescriptions, etc.] so that you do exercise as planned") was removed from the adaptive scale for a conceptual reason (versus an internal consistency improvement reason). Twenty-two participants reported "no" to taking medication in the demographic question, rendering the item irrelevant across the full sample.

The final adaptive self-regulatory responses to pain anxiety measure was comprised of five items, and had an acceptable alpha ($\alpha = .65$). For each participant, a total score was calculated by adding the final five items together. Score range was 0 to 40, with higher scores representing using more adaptive responses.

Table 2.2

Adaptive Self-Regulatory Responses Measure Internal Consistency

Item	Item Description	Cronbach's Alpha if Item Deleted: Original	Cronbach's Alpha if Item Deleted: Final
1*	Alternate the type of exercise that you planned on doing	0.33	0.60
2#	Do all of your scheduled/planned exercise	0.61	–
3^	Take pain medication so that you do exercise as planned	0.43	–
4*	Do less exercise than you planned	0.32	0.55
5*	Change the type of exercise you planned	0.24	0.53
6*	You make efforts to relax to reduce tension	0.37	0.66
7*	Use heat or ice before/after your planned exercise	0.33	0.64
	Total Cronbach's alpha	0.43	0.65

* = Item in the final adaptive self-regulatory responses scale.

= Maintenance self-regulatory response item.

^ = Item deletion.

2.2.6 *Exercise*. Participants reported the frequency and average duration of actual bouts of each of their planned moderate and vigorous exercise during the previous two weeks. A total volume (frequency x duration) was calculated in a manner consistent with international exercise recommendations and previous research among adults with arthritis (e.g., Gyurcsik et al., 2009; 2011; PHAC, 2010; USDHHS, 2008). Before completing the measure, participants read definitions of moderate and vigorous exercise (Nelson et al., 2007; CDC, 2011; USDHHS, 2008). Moderate exercise was defined as "...makes your heart beat faster and makes you breathe a little harder. You can talk easily while doing moderate exercise, but you may not be able to sing comfortably. On a scale from 0 to 10, where sitting is 0 and the highest level of effort possible is 10, moderate exercise is a 5 or 6". Vigorous exercise was defined as "… makes your heart beat much faster. You may not be able to talk comfortably without stopping to catch your breath. On a scale of 0 to 10, where sitting is 0 and the highest level of effort possible is 10, vigorous exercise is a 7 or 8."

After reading the definitions, participants reported their average weekly number of days (i.e., frequency) over the previous two weeks that they were active for at least 20 minutes for each of moderate and vigorous exercise, followed by their average exercise duration at each intensity. A minimum exercise bout of 20 minutes was used because it would require both

planning and self-regulation to achieve in contrast to unplanned shorter incidental bouts (e.g., having to walk due to parking far away from an exercise facility). Planned bouts of longer duration are more apt to be recalled and self-reported with accuracy as opposed to incidental short duration bouts of unplanned activity (Cust et al., 2008). The total volume of exercise per week was calculated by summing total moderate activity (frequency x duration) with total vigorous activity (frequency x duration). For example, a participant would have a total volume of 160 minutes/week if they reported a moderate activity response of 120 minutes (3 days x 40 minutes/day) plus a vigorous activity response of 40 minutes (2 days x 20 minutes/day).

2.3 Procedures

The study was approved by the University of Saskatchewan Behavioural Ethics Board. Participant recruitment involved the use of multiple strategies, which have been successful in past arthritis – exercise research (e.g., Gyurcsik et al., 2011). All strategies involved the use of various types of study announcements (e.g., paper, electronic) that were: (a) emailed to internet-based arthritis chat groups (e.g., Yahoo groups, CarePlace) and arthritis organizations in Canada and in the United States (e.g., The Arthritis Society; The Arthritis Foundation); (b) posted on organizations' pages on Facebook; (c) posted at local gyms and fitness centers (e.g., Fitness for 10, Cosmo Civic Centre, and Saskatoon Field House); and (d) distributed via in-person visits to community-based exercise programs in Saskatoon that target people with arthritis (e.g., First Step Program). Study announcements led participants to an online link to the baseline survey (see Appendix A for the study announcement).

The baseline survey began with informed consent. Individuals providing electronic consent then completed participant inclusion criteria questions (see Appendix B). Inclusion criteria were: (a) adult women or men, aged 18 years or older; (b) self-report of a medical diagnosis of arthritis; (c) reside in Canada or in the United States; (d) plans to participate in at least 20 minutes of moderate or vigorous exercise each week over the subsequent two weeks; (e) an immediate past history of moderate or vigorous exercise for at least 20 minutes at one time over the previous two weeks; (f) willingness to commit to the two-week study period; and (g) having arthritis pain and pain anxiety (i.e., report of more than zero on at least one item on each measure). Requiring participants to have immediate past experiences and plans to exercise ensured that they could offer an experience-based response to the exercise-related measures of adaptive and maladaptive self-regulatory responses about pain anxiety and planned exercise.

Ensuring that participants had arthritis pain and pain anxiety was required to investigate the primary study purpose on relationships between pain anxiety, pain acceptance, and self-regulatory responses to pain anxiety. Exclusion criteria included having a scheduled surgery or plans to move during the study period.

Individuals who did not meet the criteria were thanked for their interest and were exited from the survey. Individuals meeting the criteria then completed the baseline measures, including demographics, pain, pain acceptance, pain anxiety, and self-regulatory responses (Appendix C contains the survey). At the end of the survey, participants were asked to provide their email address in order for the time 2 survey link to be emailed to them two weeks later.

On the time 2 survey, participants reported their moderate and vigorous exercise over the previous two weeks (see Appendix C). To encourage study adherence, a strategy based upon previous published prospective research with a retention rate of ≥ 80% was used (e.g., Gyurcsik et al., 2009; 2011). Participants were sent up to three emails for the completion of the survey: (1) one email was sent seven days after baseline to remind participants that they would be emailed in one week with link to the time 2 survey, (2) an email exactly two weeks after baseline that contained the link, and (3) an email two days beyond their two-week time frame reminding them to complete the time 2 survey (i.e., only sent out if they had not completed the survey).

This retention strategy was successful as a study adherence rate of 80% was obtained. One hundred and seventy-one people met participation inclusion criteria and completed the baseline survey. Out of these participants, 136 completed second survey. An effort was made to over-recruit participants at baseline due to an expected and typical dropout that occurs in prospective research. General guidelines proposed by Green (1991) for the sample size needed when conducting regression analyses were used to guide sampling. A minimum of 81 study adherers was suggested if the hypothesized effects were to obtain a medium effect size at $p < .05$ for the primary hypotheses (i.e., a multiple regression analysis with four predictor variables, Green, 1991). An evaluation of study adherers versus dropouts in terms of their demographics and responses to the main study variables appearing on the baseline survey can be seen in the results section.

2.4 Data Management and Analytical Plan

SPSS 20 was used for the data analyses. Main study variables were screened for missing values. There were no cases in which responses to an entire scale were missing by a participant.

Missing scale items were identified and handled in accordance with recommendations by Tabachnick and Fidell (2012). A participant's mean value on the scale was calculated and used to replace her/his missing item response(s). The only exception was for the exercise variable. Some participants reported days of exercise but not minutes, whereas others reported minutes but not days. In such cases, an approach was taken in which the minimum possible values of one day or 20 minutes were used to replace the missing values. Doing so ensured that a minimum exercise response was included, which was a more conservative approach than using the sample mean. This strategy also preserved the intent of the instruction about reporting exercise, which the respondent had tried to answer.

Outliers were identified as having a z-score of greater than 3.29 (Tabachnick & Fidell, 2012). Three outliers in exercise were found. In accordance with Tabachnick and Fidell (2012), the lowest outlier data point was changed to one value greater than the next highest value in the data set and then the next two outliers, which were the same value, were given a value of one greater than the previously changed outlier.

The results are divided into five main sections. The first three sections concern arthritis demographics of study participants, study adherer and dropout comparisons, and finally, means and standard deviations of the main study variables.

The fourth section concerns the primary and exploratory study analyses to predict maladaptive (primary hypothesis 1), adaptive (primary hypothesis 2), and maintenance (exploratory) self-regulatory responses to pain anxiety. Three hierarchical multiple regression analyses (HMR) were conducted. In each model, pain was entered as a covariate in step 1 (Eyler, 2003) due to its significant correlations with the main study variables (see Appendix D for the correlations). Before each HMR was conducted, assumptions were checked and met (e.g., multicollinearity, homoscedasticity of residuals, linearity and normality assumptions, and independence of errors; Tabachnick and Fidell, 2012). The first HMR predicting maladaptive responses (i.e., hypothesis one) had two steps. After entering pain in step 1, pain anxiety was entered into step 2.

A second HMR with three steps was conducted to predict adaptive self-regulatory responses. Recall that pain acceptance was to be investigated as a moderator of the pain anxiety – adaptive self-regulatory responses relationship (hypothesis two). In line with recommendations to reduce multicollinearity in a moderator analysis (Aiken & West, 1991;

Evans, 1991; Frazier, Tix, & Barron, 2004), pain anxiety and acceptance were centered and then an interaction term comprised of multiplying the centered variables together was calculated. In the HMR, after entering pain, the centered pain anxiety and pain acceptance variables were entered in step 2, followed by the centered interaction term in step 3. If a significant interaction effect was found, a simple slopes analysis would be conducted (Aiken & West, 1991).

The third HMR investigated predictors of the maintenance self-regulatory response (i.e., exploratory analysis – post hoc, based on this one item being removed from the adaptive scale/frequent reporting of its use in the literature). After entering pain, centered pain anxiety and acceptance were entered in step 2, followed by the centered interaction term in step 3. Given findings from past research that continuation of planned exercise is a commonly reported strategy that helps people with arthritis to exercise (i.e., confrontation pathway in the FA model), examining pain acceptance as a moderator of the pain anxiety – maintenance self-regulatory response relationship was explored.

The fifth section concerns the results of a between-groups multivariate analysis of variance (MANOVA) that was conducted to examine the secondary study purpose and hypothesis 3. Recall that this purpose was to examine differences in the main study variables between participants meeting or not meeting the recommended dose of exercise over a two-week period.

A total of 79 participants met the exercise dose of 150+ minutes/week (PHAC, 2010) and 57 participants did not meet the dose over the two-week study period. To ensure that the two groups were empirically different from one another relative to exercise guidelines (PHAC, 2010), an independent groups *t*-test analysis was conducted. The independent variable was exercise dose groups (meeting versus not meeting) and the dependent variable was the total weekly time spent in moderate to vigorous exercise. The two groups significantly differed, $t(134) = -10.42$, $p < .001$ (met the dose, $M = 301.52 \pm 165.60$; did not meet the dose, $M = 66.83 \pm 44.47$). The empirical difference confirming the public health classification of the groups provided confidence that the comparison on other variables was not arbitrary. The MANOVA proceeded with exercise dose group as the independent variable (meeting versus not meeting) and the main study variables (pain, pain anxiety, pain acceptance, maladaptive, adaptive, and maintenance self-regulatory responses) as the dependent variables. MANOVA assumptions were also checked and met, including independent observations, multivariate normality, and

homogeneity of variance/covariance. Tests examining homogeneity of variance (Levene's) and Equality of Covariance Matrices (Box's M) were conducted and assumptions of normality were satisfied.

CHAPTER 3

RESULTS

3.1 Arthritis Demographics of Study Participants

Seventy-two participants reported being medically-diagnosed with arthritis for one to 10 years. One hundred and two participants reported some limitations in their daily activities due to arthritis and 114 took medication for their disease. See Table 3.1 for full arthritis demographic information.

Table 3.1

Arthritis Demographics of Study Participants (N = 136)

Demographic	Category	*n (%)*
Number of years diagnosed with arthritis	Less than 1 year	11 (8%)
	1-5 years	41 (30%)
	6-10 years	31 (23%)
	11-15 years	19 (14%)
	16-20 years	10 (7%)
	Over 20 years	24 (18%)
Limitation in activities due to arthritis	Yes	102 (75%)
	No	28 (20%)
	Do not know	5 (4%)
Medication to control arthritis	Yes	114 (84%)
	No	22 (16%)

Note. Full data on the 136 participants are not reported due to missing values for limitation due to arthritis ($n = 1$) and medication frequency ($n = 7$).

3.2 Evaluation of Study Adherers versus Dropouts

Study adherers ($n = 136$) and dropouts ($n = 35$) were analyzed for differences in their demographics through chi-square tests for categorical general and arthritis variables (i.e., education, gender, ethnicity, marital status, employment, number of years with arthritis, medication use, and limitation in activities due to arthritis) and a multivariate analysis of variance (MANOVA) for the continuous demographic variables of age and BMI. All chi-square analyses were non-significant (p's $> .05$), with the exception of the number of years with arthritis ($p = .04$). As seen in Table 3.2, study adherers tended to have arthritis for more years than the study dropouts. MANOVA results comparing the two study adherence groups on age and BMI were not significant, $F(1, 170) = 1.35$, $p = .26$.

Table 3.2

Categorical Demographic Variable Significantly Differing Between Study Adherence Groups

Demographic	Study Adherers *(n = 136)*	Study Dropouts *(n = 35)*
Number of years diagnosed with arthritis	*n* (%)	*n* (%)
Less than 1 year	11 (8%)	5 (14%)
1-5 years	41 (30%)	14 (40%)
6-10 years	31 (28%)	8 (23%)
11-15 years	19 (14%)	4 (11%)
16-20 years	10 (7%)	2 (8%)
Over 20 years	24 (18%)	2 (8%)

Study adherers and dropouts were also examined for differences in their baseline main study variables (pain, pain acceptance, pain anxiety, adaptive, maladaptive, and maintenance self-regulatory responses) using a between-groups multivariate analysis of variance (MANOVA). The overall model was not significant, $F(6, 164) = 1.64$, Pillai's Trace = .06, $p = .14$, $\eta^2_{partial} = .06$.

In summary, study adherers and dropouts did not significantly differ from each other in their responses to the main study measures. The two groups did not differ in general demographic characteristics. Finally, most of their arthritis characteristics did not differ, with the exception of length of time since being diagnosed with arthritis. Study adherers appeared to have lived with their arthritis longer than study dropouts.

3.3 Means and Standard Deviations of Main Study Variables

Means and standard deviations of the study variables are presented in Table 3.3. Participants reported moderate amounts of arthritis pain, modest levels of pain anxiety, and were accepting of their pain. They also reported using maladaptive and adaptive self-regulatory responses, with adaptive being reported more frequently than maladaptive. Participants reported using the maintenance self-regulatory response moderately often.

Table 3.3

Means for Study Variables (N = 136)

Variable	*M*	*SD*
Pain	4.66	1.93
Pain anxiety	29.55	18.94
Pain acceptance	67.85	17.63
Maladaptive self-regulatory responses	10.81	7.80
Adaptive self-regulatory responses	15.54	7.81
Maintenance self-regulatory response	4.83	2.36

Note. Scale ranges were as follows: pain, 0 (*no pain*) to 10 (*extreme pain*), pain anxiety (0-100) with higher scores representing more anxiety, pain acceptance (0-120) with higher scores representing more acceptance, maladaptive and adaptive self-regulatory responses (0-40), and maintenance self-regulatory response, 0 (*never do this*) to 8 (*always do this*), with higher scores on the self-regulatory response measures representing more frequent use.

3.4 Primary Purposes: Predicting Self-regulatory Responses

3.4.1 Hypothesis 1 - Predicting maladaptive self-regulatory responses. In step 1 of the HMR, pain was a significant predictor, $R^2_{adjusted} = .04$, $F(1, 134) = 6.24$, $p = .01$ (see Table 3.4 for a summary of the HMR results). Including pain anxiety in step 2 accounted for an additional and significant 40% of the variance in maladaptive responses, with the full model being significant, $F(2 , 133) = 53.80$, $p < .001$. As hypothesized, pain anxiety was a significant, independent predictor, and was positively associated with the use of maladaptive self-regulatory responses. The effect size of this HMR was medium to large (Cohen, 1988).

Table 3.4

Predicting Maladaptive Self-regulatory Responses

Predictor	R^2 Adjusted Model	$r^2\Delta$	$B_{standardized}$
Step 1	.04*		.21*
Pain			
Step 2	.44***	.40***	
Pain			.06
Pain anxiety			.65***

Note. $N = 136$. *$p < .05$, ***$p < .001$

3.4.2 Hypothesis 2 - Predicting adaptive self-regulatory responses. In step 1 of the HMR predicting adaptive self-regulatory responses, pain was a significant predictor, $F(1, 134) = 11.51$, $p = .001$ (see Table 3.5 for a summary of the HMR analysis). Including the two centered predictor variables of pain anxiety and pain acceptance in step 2 resulted in a significant model, $F(3, 132) = 10.65$, $p < .001$, accounting for an additional and significant 12% of the variance in adaptive self-regulatory responses. Adding the centered interaction variable (pain anxiety x pain acceptance) in step 3 contributed an additional and significant 3% variance to the model. The full model was significant, $F(4, 131) = 9.57$, $p < .001$, accounting for 20% of the variance in adaptive self-regulatory responses.

As hypothesized, the interaction term was a significant, independent predictor. The effect size of this interaction was small (Cohen, 1988). Regardless, given the significant interaction, a simple slopes analysis was conducted (see Figure 1). Results of the analysis revealed that the regression line for the lower pain acceptance was not significantly different than zero, $t(131) = 0.18$, $p = .86$. However, the regression line for those with higher pain acceptance was significantly different than zero, $t(131) = 2.44$, $p = .02$. Examination of Figure 1 illustrates that participants with higher pain acceptance used adaptive self-regulatory responses less often when pain anxiety was lower, than those with lower pain acceptance. However, when pain anxiety was higher, both lower and higher pain acceptance was associated with the use of adaptive self-regulatory responses.

Table 3.5

Predicting Adaptive Self-regulatory Responses

Predictor	R^2 Adjusted Model	$r^2\Delta$	$B_{standardized}$
Step 1	.07*		.28***
Pain			
Step 2	.18***	.12***	
Pain			.19*
Pain anxiety			.12
Pain acceptance			-.26*
Step 3	.20*	.03*	
Pain			.20*
Pain anxiety			.19
Pain acceptance			-.20
Pain anxiety x Pain acceptance			.18*

Note. $N = 136$. *$p < .05$, ***$p < .001$.

Figure 3.1

Interaction between Pain Anxiety and Pain Acceptance

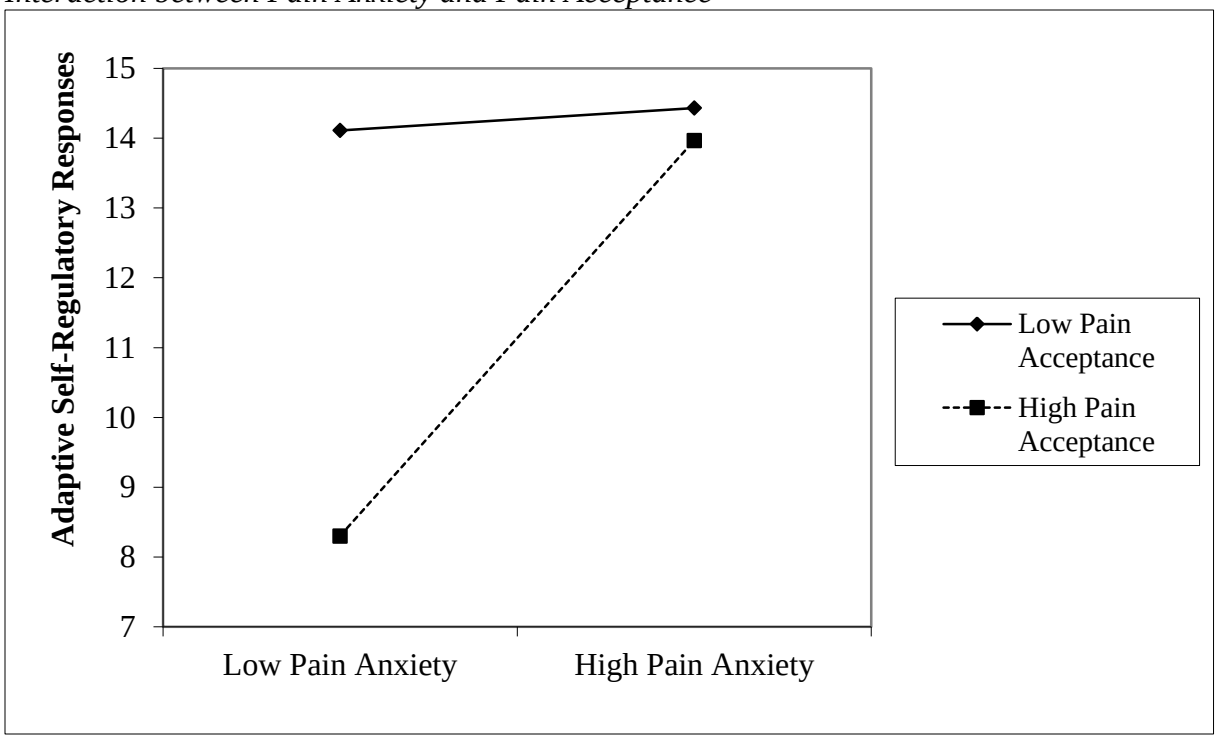

Figure 3.1. Interaction between pain anxiety x pain acceptance predicting adaptive self-regulatory responses.

3.4.3 Predicting maintenance self-regulatory response (exploratory – post hoc). In step 1 of the HMR predicting the maintenance self-regulatory response, pain was not a significant predictor, $F(1, 134) = .70$, $p = .40$ (see Table 3.6 for a summary of the HMR analysis). Including the two centered predictor variables of pain anxiety and pain acceptance in step 2 resulted in a significant model, $F(3, 132) = 15.86$, $p < .001$, accounting for an additional and significant 26% of the variance in the maintenance self-regulatory response. With the addition of the centered pain anxiety x pain acceptance interaction in step 3, the overall model was significant, $F(4 , 131) = 11.81$, $p < .001$. However, the interaction did not contribute additional significant variance to the model, $p = .89$. Pain acceptance was the sole significant independent predictor of the maintenance self-regulatory response. As pain acceptance increased, participants also reported more use of the maintenance response. This represented a large effect size (Cohen, 1988).

Table 3.6

Predicting Maintenance Self-regulatory Response

Predictor	R^2 Adjusted Model	$r^2\Delta$	$B_{standardized}$
Step 1	.005		
Pain			-.07
Step 2	.25***	.26***	
Pain			.07
Pain anxiety			-.13
Pain acceptance			.43***
Step 3	.24***	.03	
Pain			.07
Pain anxiety			-.13
Pain acceptance			.47***
Pain anxiety x pain acceptance			.01

Note. $N = 136$. ***$p < .001$

3.5 Secondary Purpose: Exercise Dose Group Differences

3.5.1 Hypothesis 3. The overall between-groups MANOVA comparing exercise dose groups (meeting/not meeting) on the main study variables was significant, $F(6, 129) = 4.62$, Pillai's Trace = .18, $p < .001$ (see Table 3.7 for the variable means and standard deviations by group). Follow-up analyses of variance revealed support for most of the hypothesized findings. As expected, the group meeting the recommended exercise dose had significantly: (a) lower pain anxiety, $F(1, 134) = 7.25$, $p = .01$, Cohen's $d = .46$; (b) higher pain acceptance, $F(1, 134) = 18.65$, $p < .001$, Cohen's $d = -.75$; and (c) reporting using maladaptive self-regulatory responses less, $F(1, 134) = 15.07$, $p < .001$, Cohen's $d = .68$, compared to those not meeting the dose. Also in line with expectations, the two groups did not significantly differ in their arthritis pain, $F(1, 134) = 1.95$, $p = .16$, Cohen's $d = .25$.

Contrary to the hypothesis, the two groups did not significantly differ in their use of adaptive self-regulatory responses, $F(1, 134) = 2.05$, $p = .15$, Cohen's $d = .25$. Finally, the group who met the exercise dose reported using the maintenance self-regulatory response significantly more often than the group not meeting the dose, $F(1, 134) = 18.83$, $p < .001$, Cohen's $d = -.76$.

Table 3.7

Group Differences for Participants Who Met/Did not Meet Exercise Dose

Variable	Met Dose *(n = 79)*	Did Not Meet Dose *(n = 57)*	
	M (SD)	*M (SD)*	$\eta^2_{partial}$
Pain	4.46 (1.86)	4.94 (2.01)	.01
Pain anxiety	25.92 (18.01)	34.58 (19.21)	.05**
Pain acceptance	73.07 (16.61)	60.62 (16.54)	.12***
Maladaptive self-regulatory responses	8.71 (7.49)	13.72 (7.34)	.10***
Adaptive self-regulatory responses	14.73 (7.48)	16.67 (8.19)	.02
Maintenance self-regulatory response	5.53 (2.26)	3.86 (2.16)	.12***

Note. $N = 136$. Scale response ranges were pain: 0 (*no pain*) to 10 (*extreme pain*); pain anxiety: (0-100) higher scores represent more anxiety; pain acceptance: (0-120) higher scores represent more acceptance; maladaptive and adaptive self-regulatory responses: (0-40) higher scores represent more frequent use of each response type; and maintenance self-regulatory response: 0 (*never do this*) to 8 (*always do this*). $^{**}p < .01$, $^{***}p < .001$.

CHAPTER 4

DISCUSSION

Given the low levels of exercise among adults with arthritis (PHAC, 2010), research is needed on theory-based processes important for adherence (Alliance for the Canadian Arthritis Program, 2006). Self-regulation may be a key process important to persisting with exercise plans when challenged (Bandura, 1997). No research to date had examined factors associated with the use of self-regulatory responses to challenges that may affect exercise. Thus, the present study was conducted to begin to address this need.

Primary study purposes involved examination of whether arthritis pain anxiety (i.e., a potential challenge) was predictive of maladaptive self-regulatory responses and whether pain acceptance moderated the relationship between pain anxiety and adaptive self-regulatory responses. Consistent with contentions from the FA model and models of self-regulation (e.g., Baumeister, 2002; Vlaeyen & Linton, 2002), pain anxiety was a significant predictor of maladaptive self-regulatory responses. Further, pain acceptance was a significant moderator of the pain anxiety – adaptive self-regulatory responses relationship.

Findings concerning the secondary purpose supported study hypotheses that participants meeting the recommended dose of exercise for disease management (i.e., 150+ minutes/week; PHAC, 2010) would have significantly lower pain anxiety, higher pain acceptance, and report using maladaptive responses less often compared to participants not meeting the dose. In contrast to study hypotheses, the two groups did not significantly differ in their use of adaptive strategies. Finally, the group meeting the dose reported using the maintenance self-regulatory response significantly more than the group not meeting the exercise dose.

4.1 Maladaptive Self-regulatory Responses

In line with the primary study hypothesis, HMR findings revealed that pain anxiety was a significant, independent predictor of maladaptive self-regulatory responses. As participants reported more pain anxiety, they also reported more frequent use of maladaptive responses. Recall the FA model purports that when experiencing pain anxiety, individuals respond along two behavioral pathways. They may avoid or adapt (Crombez et al., 2012; Vlaeyen & Linton, 2000). Various factors, including the use of self-regulatory responses, help to determine the extent to which individuals engage in these pathways. However, the HMR findings provided the first evidence of a positive association between anxiety and maladaptive self-regulatory

responses to pain anxiety among adults with arthritis attempting to exercise. In the avoidance pathway, pain anxiety becomes individuals' central focus, leading to hypervigilance. This can reduce individuals' self-regulatory strength, which may be reflected by the use of maladaptive self-regulatory responses to deal with their pain anxiety, and avoidance/escape of future exercise. The present study design did not allow for an examination of all pathways and self-regulatory relationships but, nonetheless, provided preliminary support of some of the contentions in the FA model.

The secondary MANOVA analysis also revealed that participants not meeting the recommended exercise dose had significantly higher pain anxiety and used maladaptive self-regulatory responses significantly more than participants meeting the dose. As expected, the two groups did not differ in their arthritis pain. Taken together, findings appear to align with FA model contentions that pain is not what leads to disengagement from exercise/daily activities. Disengagement is purported in the FA model to be related to the reactions of people to their pain, as manifested in the present study by anxiety about the potential for pain in the future (i.e., pain anxiety) and the use of maladaptive self-regulatory responses to that anxiety (e.g., Esteve & Ramirez-Maestre, 2013; McCracken et al., 1999). Findings also parallel suggestions from the larger chronic pain literature that people's social cognitive responses to their pain are related to their activity engagement or avoidance (e.g., McCracken & Gutierrez, 2011; White et al., 2013). However, it would be remiss not to highlight that participants in the present study did not completely avoid their exercise (i.e., not exercise at all). Perhaps lower levels of exercise, which might occur in part because people utilize maladaptive self-regulatory responses to deal with their pain anxiety, may lead to eventual and total exercise avoidance. According to the FA model, by responding to pain anxiety in maladaptive ways, people may then perpetuate the effects of their pain anxiety, which could increase the likelihood of choosing to avoid exercising in the future. This remains to be investigated in future research with an appropriate design versus the descriptive findings of the present research.

4.2 Adaptive Self-regulatory Responses

Findings in the present study provided the first evidence in the arthritis – exercise domain that pain acceptance was a significant moderator of the pain anxiety – adaptive self-regulatory responses relationship. Lower pain anxiety and higher pain acceptance was associated with less reported use of adaptive self-regulatory responses. In contrast, lower pain anxiety and lower

acceptance was associated with the more frequent reported use of adaptive responses. Further, when pain anxiety was higher, the more frequent use of adaptive responses was reported regardless of pain acceptance levels.

The potential moderation of higher acceptance may be explained through complementary views from self-regulation and the FA model. Confrontation of pain anxiety occurs when people are challenged by pain anxiety, but have the self-regulatory strength to persist in overcoming their anxiety-related challenge (Leeuw et al., 2006). Having *higher pain acceptance* may cause individuals to perceive their pain anxiety to be a challenge, requiring adaptation efforts, *only* when it is higher. In contrast, *lower pain acceptance* may mean that individuals perceive their pain anxiety, regardless of whether it is higher or lower, as a challenge requiring adaptation efforts.

When more highly accepting of pain, people may only attempt to reduce pain or associated outcomes, like pain anxiety, when they are at higher, more challenging levels (Crombez et al., 2012). In contrast, when pain anxiety is lower, presenting less of a challenge, higher pain acceptance may allow individuals to reduce their adaptation efforts because self-regulatory capacity is not being taxed to as great of an extent (i.e., no or minimal need to attempt to reduce/control anxiety). They may be simply focused on engaging in their valued activities with little control attempts being made to adapt (cf. Crombez et al., 2012). However, when pain anxiety is higher/more challenging, self-regulatory models suggest that a focused use of adaptive self-regulatory responses may be required to engage in valued activities (Baumeister, 2002).

In contrast, when pain acceptance is lower, pain anxiety may be perceived as being a challenge at all levels, requiring the use of adaptive strategies in attempts to reach valued, goal directed behaviors. To extend the research, it would be interesting to examine whether adaptive strategies are effective in influencing individuals to carry out plans to exercise. Doing so may shed light on whether lower pain acceptance people attempt to use all of their adaptive responses to deal with their pain anxiety so they can attempt planned exercise. Conceptually, according to the FA and self-regulatory strength models, such a drain on self-regulation may lead to eventual exercise non-adherence. In contrast, higher pain acceptance people may only use adaptive strategies to deal with their pain anxiety when needed (i.e., higher pain anxiety), which would not be as draining to the self-regulatory system, allowing persistence and exercise adherence.

Such FA model and self-regulatory strength model-bound speculations should be investigated in future research.

The moderation finding should be interpreted with cautious optimism. Recall that the interaction effect size was small, accounting for 3% of the variance in adaptive self-regulatory responses. Furthermore, a review of the pain anxiety scale mean illustrated that, overall, participants reported lower overall levels of pain anxiety. A larger effect may have been found if participants had reported higher levels of anxiety, requiring greater self-regulatory strength and the use of more adaptive strategies to exercise as planned in the face of anxiety. On the 0 – 100 response scale range, with higher scores representing higher anxiety, the sample mean was slightly above the lowest 25% of the range (M = 29.55). It should be noted, however, the mean score was comparable to other clinical and non-clinical samples (Carleton & Asmundson, 2009; McCracken & Dhingra, 2002; Thibodeau, Welch, Katz, & Asmundson, 2013). Further, despite the lower pain anxiety levels, there was a significant association with self-regulatory responses and there were differences between groups (small to medium effect sizes) who exercised at different levels, derived from public health recommendations.

In retrospect, lower pain anxiety levels may not be surprising given that the sample was required to have both past experiences and near future plans to exercise in order to participate in the study. Also, recall that study participants were living with their arthritis longer than the study dropouts. Given that the participants were not completely avoiding exercise and had experiences with their arthritis over time, their anxiety should have been expected to be within the lower to moderate range. According to the FA model, as anxiety increases, avoidance increases (Vlaeyen & Linton, 2000). The inclusion of individuals who completely avoided exercise was not a purpose in the present study. Regardless, due to the lower levels of pain anxiety reported in the present study, the potential of detecting a medium to large moderator effect size may have been reduced. Although self-regulation is required when people are challenged (Bandura, 1997), the lower levels of pain anxiety in combination with only moderately frequent use of adaptive responses appears to be a reasonable explanation for the small effect size of the moderator in the sample.

Regarding the secondary study purpose, the group meeting the exercise dose did not report using significantly more adaptive self-regulatory responses compared to the less active individuals. This finding contrasts with hypotheses that confrontation of pain anxiety aided by

the use of adaptive self-regulatory responses should result in exercising (FA model: Lethem et al., 1983). Although speculative, at least two explanations may account for this finding. First, although acceptable, the adaptive self-regulatory responses measure had an internal consistency value of .65, which was approaching the lower end of what is considered to be acceptable (i.e., .60; Field, 2005). A resultant increase in measurement error may account for the lack of differences in adaptive responses between the two exercise groups. The second potential explanation revolves around the more frequent use of the maintenance self-regulatory response – simply doing what you planned (versus adapting) by the group meeting the exercise dose

4.3 Maintenance Self-regulatory Response

Although maintenance self-regulatory responses were not originally included for examination in the present study, recall that a one-item measure about maintenance was used in the current study as an exploratory notion through a post hoc analysis. Recall that this item was separated from the original adaptive self-regulatory responses scale. However, it was retained for analysis because exercise adherers frequently reported using this strategy in past arthritis – exercise research (i.e., potential confrontation strategy; Crombez et al., 2012). Participants who met the public health exercise dose in the present study reported using the maintenance self-regulatory response significantly more frequently than those not meeting the dose. It may be that participants who exercised at the recommended levels have learned that an effective strategy is maintenance – just keep doing what they are doing. Inasmuch as both exercise groups use adaptive strategies equally, it may be that those meeting the exercise dose also use the maintenance response with success. Given the frequent reporting of this strategy in other arthritis – exercise research (e.g., Der Ananian et al., 2006b; Gyurcsik et al., 2009), future investigation relative to confrontation of pain anxiety is needed.

The HMR findings in the present study also illustrated that the maintenance self-regulatory response was predicted solely by pain acceptance. As acceptance increased, an associated increase in the use of the maintenance response was found. The finding supports past research illustrating the important relation of pain acceptance to performance of exercise among people with chronic disease (e.g., Gyurcsik et al., 2011; Rejeski et al., 2008). Further, given that pain acceptance involves a willingness to engage in activities (McCracken, Vowles, & Eccleston, 2004), the finding of a positive relationship between acceptance and a maintenance self-regulatory response should be expected relative to PA.

4.4 Arthritis Pain

Of interest across the present study was that level of pain neither predicted maladaptive or maintenance self-regulatory responses, nor differed between exercise groups. This finding supports the FA model and suggestions from researchers in the larger chronic pain domain (Crombez et al., 2012; Esteve & Ramirez-Maestre, 2013; Leeuw et al., 2006). Specifically, social cognitive responses to pain, including pain anxiety, may be potential factors that influence pain-related cognitive and behavioral outcomes. Despite the frequent mention of pain as a barrier to exercise in qualitative research (Der Ananian et al., 2006a; Hewlett et al., 2011), it rarely predicts exercise adherence (e.g., Eyler, 2003; Gyurcsik et al., 2009).

4.5 Strengths and Limitations

As with any research, the current study had limitations. The first is the generalizability of findings to the population. The study sample was exercising at some level, predominantly white, female, obtained some form of post-secondary education, and lived with their arthritis longer than study drop-outs. This occurred despite the use of varied recruitment strategies (e.g., online chat forums, such as Facebook and Yahoo groups) that did not require membership fees or exclusivity beyond members having some type of arthritis. Different findings may have resulted with a more varied and representative sample of adults with arthritis.

A second limitation was the lack of pilot testing of the new self-regulatory responses measures. While measures were content valid, given the items drawn from past research (e.g., Crombez et al., 2012; Der Ananian et al., 2006a; Gyurcsik et al., 2009), pilot testing among individuals with arthritis similar to those in the main study may have identified any issues with readability or enhanced content validity. However, the researcher monitored participants' responses to identify if any pattern of missing data was a marker of a selection issues in the sample (Tabachnick & Fidell, 2012). None were observed.

A third, related limitation, could have been the one-item maintenance self-regulatory measure. The item was determined to be different from the adaptive self-regulatory responses measure. However, its frequent report in the present study and in past arthritis – exercise literature merited its analysis. Further, Fuchs and Diamantopoulos (2009) suggest that a one-item measure can be used when the construct is simple and single faceted. Future research should investigate if this is the case for maintenance self-regulatory responses.

The current study had several strengths. First, given the lack of health-related research that is theory-based (Painter et al., 2008), one strength was the use of both self-regulation and FA models (Baumeister, 2002; Lethem et al., 1983). Second, the current study addressed a recommendation by Crombez and colleagues (2012) to examine the FA model using a motivational perspective that includes self-regulatory processes and pain acceptance. Third, the self-regulatory responses measures, while developed for use in the present study, provide the arthritis – exercise domain with new measurement tools where there were none previously. Such tools can be potentially improved and validated further in future research. Fourth, is that the study was first to examine predictors of self-regulatory responses to pain anxiety relative to exercise among people with arthritis – addressing a need to understand the psychological processes associated with adherence in this population (Alliance for the Canadian Arthritis Program, 2006).

4.6 Future Research

Given the low rates of adherence to the recommended dose of exercise for disease self-management (PHAC, 2010), and limited research on theory-based social cognitive processes contributing to this motivated behavior, continued research is warranted. Thus, a replication study of similar design with the same variables would strengthen the reliability findings if similar relationships were detected. Such research should also attend to recruiting individuals with higher levels of pain anxiety. For example, anxiety may be worse than usual/typical when people are in an arthritis flare (i.e., an exacerbation of typical arthritis symptoms, including pain: Bingham III et al., 2009) and trying to adhere to planned exercise. Another sample with higher pain anxiety might be individuals who were recently diagnosed with arthritis by a medical professional. Such individuals may have higher pain anxiety levels, given the newness of their disease, and use maladaptive self-regulatory responses more often. In parallel, newly diagnosed individuals may not have the experience both with their disease and with mastery in identifying and attempting adaptive self-regulatory responses that help them to continue to exercise as planned in the face of their anxiety, contributing to higher levels.

Future research should continue to use and refine the newly developed self-regulatory responses measures. For example, although acceptable, the internal consistency of the adaptive self-regulatory responses measure has room for improvement. Additional items on the measure would more than likely contribute to enhanced internal consistency (Clark & Watson, 1995),

which suggests that research efforts be made to identify salient adaptive responses used by exercising adults with arthritis. For example, a focus group methodology could be used to draw out the items, followed by their addition to the current adaptive measure and pilot testing for reliability and validity could then ensue (e.g., internal consistency, test-retest reliability, predictive validity). Further, given that the self-regulation model (Baumeister & Heatherton, 1996) suggests people may only use self-regulatory responses to pain anxiety when it is considered a challenge, future research should confirm whether people's pain anxiety levels are indeed perceived as a challenge. This could take the form of a simple one-item question after people report their pain anxiety on a survey (e.g., "Is your pain anxiety a challenge to you exercising as planned?"). If so, then this would provide an even stronger test of contentions from both the FA and self-regulatory models.

An extended longitudinal study design with multiple time periods of assessment should be conducted (e.g., measures administered one time per month for six months). Doing so would provide a better understanding of within-person changes in anxiety, acceptance, and self-regulatory responses variables, as well as in exercise. Data could be analyzed to provide a better understanding of what people 'look like', in terms of their levels of anxiety, acceptance, and self-regulatory responses when they decrease or completely avoid exercise versus when they confront their pain anxiety and adhere. Obtaining a social cognitive profile of people at risk for exercise avoidance may be a useful tool in the future to identify those who are in need of intervention to deal with their pain anxiety. Tied to this type of study design, future research could examine the adaptive and maintenance self-regulatory responses as mediators between pain anxiety and exercise adherence.

In addition, future research could involve examination of maladaptive self-regulatory responses as a mediator between pain anxiety and avoidance of exercise. Theoretically, the FA and self-regulatory models suggest that people who perceive their pain anxiety as challenging may be hypervigilant. In turn, such individuals may be using up their limited capacity self-regulatory strength to overly focus on their pain anxiety. Doing so should result in the greater use of maladaptive self-regulatory responses and, in turn, exercise avoidance. Future research should also investigate relationships that were hypothesized to be found, but were not, in the present study. For example, adaptive self-regulatory responses were expected to be significantly higher in the group meeting the recommended exercise dose compared to the group not meeting

the dose. However, no differences were found. Continued refinement of the adaptive measure, as suggested earlier, may result in the finding of this expected difference and thus, supportive of the FA model. Taken together, given the preliminary stage of the present research, all of the study purposes are worthy of continued investigation to determine the consistency of findings across samples.

Pain acceptance was an important component of the current study. Two ideas for future research include: (a) examination of whether pain acceptance must reach a certain level for active people with arthritis to be able to confront and overcome their pain anxiety and, if this is the case, (b) examine if an intervention to increase pain acceptance reduces anxiety and increases adaptive self-regulatory responses. For example, participants could be exposed to a pain acceptance intervention (e.g., Acceptance and Commitment Therapy) with measures of pain anxiety and responses compared pre- and post- intervention.

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APPENDIX A

Study Announcement

Do YOU have ARTHRITIS? – We need your help please!

This study focuses on important research needs identified by The Arthritis Society in Canada.

Can you take part in our study? You can participate if you are 18 years of age or older and a doctor or other health-care person, like a physiotherapist, has told you that you have arthritis.

We are studying what helps people exercise regularly. We are also interested in what makes it hard to exercise. You do not have to be exercising right now to participate.

Want to volunteer? It's as easy as…

…filling out 1 to 2 online surveys. After you do the first survey, you may be emailed a link to do a second survey, 2 weeks later. The surveys will ask you questions about your arthritis. The surveys will also ask you about your current exercise patterns.

The surveys are very easy to complete. The first survey will take about 20-30 minutes to do. The second survey (2 weeks later) is even shorter to do, taking only about 5-10 minutes. ***Doing the survey(s) would be of great help to us!***

As a thanks for your help: You have a chance to be selected ***to receive a $10 gift card to a national coffee/sandwich shop!*** 60 volunteers who do survey 1 and 30 volunteers who do survey 2 will be randomly selected to receive the gift cards!

Are there any risks to you? There are ***no risks to doing our study***.

You simply describe thoughts you have about doing exercise and about your arthritis. You also describe your usual exercise pattern. It's that simple!

Will your answers be confidential? Of course – completely confidential!
No one other than the researchers will see your answers, plus we only present our findings in group form. We have procedures in place to make sure that your answers are carefully protected.
Our study is approved by the Behavioural Research Ethics Board, University of Saskatchewan (BEH# 12-211).

If you are interested in volunteering, have arthritis, are at least 18 years of age then follow this link:

http://fluidsurveys.com/s/UofS-arthritis-survey/

The link will begin with an informed consent form, followed by the survey.

Got Questions? We have answers: Please email our research coordinator, Miranda Cary at arthritis.study.uofs@usask.ca

***Results may help people to exercise more and help them to better manage their arthritis.**

http://fluidsurveys.com/s/UofS-arthritis-survey/	http://fluidsurveys.com/s/UofS-arthritis-survey/	http://fluidsurveys.com/s/UofS-arthritis-survey/	http://fluidsurveys.com/s/UofS-arthritis-survey/	http://fluidsurveys.com/s/UofS-arthritis-survey/	http://fluidsurveys.com/s/UofS-arthritis-survey/	http://fluidsurveys.com/s/UofS-arthritis-survey/	http://fluidsurveys.com/s/UofS-arthritis-survey/	http://fluidsurveys.com/s/UofS-arthritis-survey/	http://fluidsurveys.com/s/UofS-arthritis-survey/	http://fluidsurveys.com/s/UofS-arthritis-survey/

APPENDIX B. PARTICIPANT SCREENING

Participant Consent Form

Project Title: Managing arthritis using physical activity: Identifying disease- and activity-specific psychosocial beliefs to improve adherence.

Researchers: 1) Nancy Gyurcsik, PhD, Associate Professor, College of Kinesiology, University of Saskatchewan. Phone: (306)966-1075 Email: nancy.gyurcsik@usask.ca 2) Larry Brawley, PhD, Professor and Canada Research Chair, College of Kinesiology, University of Saskatchewan. Phone: (306)966-1076 Email: larry.brawley@usask.ca 3) Kevin Spink, PhD, Professor, College of Kinesiology, University of Saskatchewan. Phone: (306)966-1074 Email: kevin.spink@usask.ca 4) Shaelyn Strachan, PhD, Assistant Professor, Faculty of Kinesiology and Recreation Management, University of Manitoba. Phone: (204)474-6363 Email: strachas@cc.umanitoba.ca 5) Danielle Brittain, PhD, Assistant Professor, School of Human Sciences, University of Northern Colorado. Phone: (970)351-2859 Email: danielle.brittain@unco.edu 6) Miranda Cary, BSc., Graduate student and Research Assistant, College of Kinesiology, University of Saskatchewan. Phone: (306)966-1075 Email: miranda.cary@usask.ca 7) James Sessford, MSc., Graduate student and Research Assistant, College of Kinesiology, University of Saskatchewan. Phone: (306)966-1075 Email: james.sessford@usask.ca

Purpose of the Research: Doing exercise on a regular basis can help people better manage their arthritis. However, over half of people with arthritis have a hard time exercising regularly. This research will help us figure out what challenges people with arthritis face to doing exercise and what may help them to exercising more regularly. We are looking for people who are not exercising right now as well as those who are exercising right now.

Procedures: To participate, you will be asked to fill out one or maybe 2 surveys on the internet. The first survey will take about 20-30 minutes. If you are asked to fill out the second survey, you will be asked to do so 2 weeks later. The second survey will take about 5-10 minutes. Total participation time will be about 20-30 minutes if you do one survey and 50 minutes if you do both surveys. You can do the surveys at any computer of your choosing, at any time of the day, and at any location. You will be asked to give us your email address on the first survey. This will allow us to enter you in the drawing for gift cards, as a token of our appreciation, and/or email you the link to the second survey, 2 weeks later. It will also allow us to send you up to five reminder emails to do the second survey, if needed are asked to do so. We hope to get around 425 people to volunteer for our research. The surveys will ask you to report your thoughts about your arthritis and what exercise that you actually do. You may also get asked for your thoughts about doing exercise. We will also ask you to report information about yourself, such as your age. This information will help us to describe the people who are eligible to do the surveys (e.g., average age, employment status). We can also compare the group of people who do are eligible

versus not eligible to do the surveys. We will only use group data, like average age, versus individually reported data in our comparisons and descriptions. Please ask us if you have any questions about these procedures, the goals of our study, or your potential role in it.

Funded by: We have received funding to do this research by the Canadian Institutes of Health Research – Regional Partnership Program (with the Saskatchewan Health Research Foundation).

Potential Risks: There are no known or expected risks to you by participating in this research.

Potential Benefits: There is no guarantee that you will benefit directly from participating in this research. However, your participation will provide valuable information on what helps or makes it hard to do regular exercise. Knowing this may help us to design programs that can help other people with arthritis do regular exercise as one way to manage their arthritis.

Compensation: We appreciate the time taken by study participants to do the surveys. We will offer a small token of our appreciation in the form of a random draw for 90 gift cards, at $10 each, to a national coffee/sandwich chain. We will randomly select 60 people who do the first survey and then do a random draw again for 30 people who do the second survey. If you are randomly selected, we will email you to ask for your mailing address. Once the gift card is mailed to you, we will destroy your mailing address to maintain your confidentiality.

Confidentiality: If you participate in our study, you will be asked to provide your email address on the first survey. We need your email address so that we can email you a link to the second survey in 2 weeks, if you do it. We will also send up to five reminder emails asking you to do the second survey. Because email addresses may have people's names in them, such participants may be identified. In these cases, study participation may not be anonymous. If you are selected in the random draw for the gift cards, we will email you to ask for your full mailing address. This means that you will then be able to be identified. However, in both of these cases, we guarantee confidentiality of study participants. All personal information (name and mailing addresses; email addresses) will be destroyed once our research is done. Only the research team will have access to the data. The data from the study will be published and presented at conferences in group form. It will not be possible to identify any individuals who participated in our research.

Storage of Data: All data obtained from the surveys will be stored electronically on a password protected computer and memory stick. Both the computer and memory stick will be stored in the locked office of Dr. Nancy Gyurcsik at the University of Saskatchewan for five years. Only the researchers will have access to the data and the password to access the data.

Right to Withdraw: Study participation is completely voluntary. You can answer only those questions that you are comfortable with. You have the right to withdraw from this research for any reason, at any time without explanation or penalty of any sort. Should you wish to withdraw, you simply have to close your web browser to exit the survey. If you wish to have your data destroyed, please contact the lead researcher, Dr. Nancy Gyurcsik, by telephone (306 966-1075)

or email (nancy.gyurcsik@usask.ca). Your right to withdraw data from the study will apply until data have been collected and pooled, which will be August 1, 2013. After this time, it will be no longer possible that some form of research dissemination will have already occurred and it may not be possible to withdraw your data.

Follow-up: You will be asked whether you wish to obtain a summary of the results from our research at the end of survey one. If you answer 'yes', then we will email you a copy of the results by the end of November 2013.

Questions or Concerns: Contact any of the researchers using the information at the top of this form on page 1 if you have any questions or concerns. This research project has been approved on ethical grounds by the University of Saskatchewan Research Ethics Board on December 11, 2012. Any questions regarding your rights as a participant may be addressed to the committee through the Research Ethics Office, email: ethics.office@usask.ca, or call (306) 966-2975. Out of town participants may call toll free (866) 966-2975.

By completing and submitting the following survey, YOUR FREE AND INFORMED CONSENT IS IMPLIED and indicates that you understand the above conditions of participation in this study.

____ Yes - I provide my consent (individuals skip to the participant screening questions)

____ No – I am NOT providing my consent (individuals are asked to exit from the survey system and thanked for their time)

Inclusion Criteria

1) What is your age in years: ____ (must indicate 18+ years to participate)

2) Have you ever been told by a doctor or other health care professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?
Yes_____ No_____ (must answer 'yes' to participate)

3) Where do you live (check ✓ one)?
☐ **Canada** (must answer Canada or the USA to participate)
☐ **USA**
☐ **Other country**

4) Are you scheduled for surgery during the next two weeks (when our study is taking place)? Yes ___ No___ (must answer 'no' to participate)

5) Do you have plans to move during the next two weeks (14 days)? Yes_____ No_____
(must answer "no" to participate)

6) Past Exercise

We would like you to think about your exercise history. As an ACCURATE REPORTING of your exercise is one key to our research, please carefully read the following:

ONLY think about EXERCISE THAT YOU PLANNED TO DO IN YOUR FREE TIME FOR 20 MINUTES OR MORE. This means that you scheduled/planned it and set time aside in your day to exercise.

Some examples of exercise: You may be registered in a swim/aerobics class at a local gym – this means that you have plans to exercise on each day that your class takes place in a week.

Exercise may also be planned when you get up in the morning – you notice it is nice outside and you plan to walk outside. The KEY is that you plan to exercise in advance and set time aside in your free time to exercise for 20 minutes or more.

We understand that you may do other types of exercise, like walking while doing groceries, have a physically demanding job, or you may do planned exercise for less than 20 minutes at one time. These types exercise are not the focus of our research.

With this in mind, please think about 2 types of planned exercise: (1) Moderate and (2) Vigorous.

<u>Moderate Exercise</u> makes your heart beat faster and makes you breathe a little harder. You can TALK EASILY while doing moderate exercise, but you may not be able to sing comfortably.

<u>Vigorous Exercise</u> makes your heart beat much faster. You may NOT BE ABLE TO TALK COMFORTABLY without stopping to catch your breath.

Intensity can be estimated using a scale of 0 to 10, where sitting is 0 and 10 is the highest level of effort possible. Moderate intensity exercise is a 5 or 6. Vigorous intensity exercise is a 7 or 8.

A) Think about the last 2 weeks (14 days). Did you do any planned moderate or vigorous exercise for at least 20 minutes at one time during your free time?

Yes_____ No_____ (must answer "yes" to participate; "no", individuals are asked to exit from the survey system and thanked for their time)

On average, how many days in each 7 day period (1 week) did you <u>actually do</u> MODERATE exercise for at least 20 continuous minutes during your free time?

_____ 0 days in a week
_____ 1 day in a week
_____ 2 days in a week
_____ 3 days in a week
_____ 4 days in a week
_____ 5 days in a week
_____ 6 days in a week
_____ 7 days in a week

How many TOTAL MINUTES were you doing planned moderate exercise in a typical day? For example, you may have done two walks of 20 minutes each – so you would put 40 minutes below. Or you may have walked or done another type of moderate exercise for 35 minutes at one time – so you would put 35 below.

_____ Total minutes in a typical day (remember – only think about those times when you did 20 or more minutes)

What kinds of moderate exercise did you do (check all that apply)?

_____ Walk
_____ Swimming class
_____ Swim laps
_____ Land-based exercise class
_____ Bike
_____ Other (please write the activity here):_____

Please think about the last 2 weeks (14 days). On average, how many days in each 7-day period (1 week) did you <u>actually do</u> VIGOROUS exercise for at least 20 continuous minutes during your free time?

_____ 0 days in a week
_____ 1 day in a week
_____ 2 days in a week
_____ 3 days in a week
_____ 4 days in a week
_____ 5 days in a week
_____ 6 days in a week
_____ 7 days in a week

How many TOTAL MINUTES were you doing your planned vigorous exercise in a typical day?
_____ Total minutes in a typical day (remember – only report the total time you spent doing vigorous exercise of 20 minutes or more)

What kinds of vigorous exercise did you do (check all that apply)?
_____ Walk
_____ Swimming class
_____ Swim laps
_____ Land-based exercise class
_____ Bike
_____ Other (please write the activity here):__

APPENDIX C. STUDY MEASURES

Baseline Survey

Chronic Pain Acceptance Questionnaire (CPAQ)

Below you will find a list of statements. Please rate the truth of each statement as it applies to you and your arthritis pain. 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.

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

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

Pain intensity

These questions ask you about your arthritis pain. Two instances will ask you about arthritis "flare" situations.

When we use the term "flare", we are referring to those "bad days" of worse/increased symptoms beyond your usual symptoms. Please keep in mind that the "bad day" symptoms are not always the same for every person with arthritis. A flare may also be a series of more than one consecutive "bad day" and can last for varying amounts of time.

1) How much pain do you have from your arthritis during a TYPICAL DAY?

0 No pain	1	2	3	4	5 Moderate pain	6	7	8	9	10 Extreme pain

2) How much pain do you have from your arthritis during a TYPICAL FLARE?

0 No pain	1	2	3	4	5 Moderate pain	6	7	8	9	10 Extreme pain

3) How much pain do you usually have from your arthritis when you are NOT IN A FLARE?

0 No pain	1	2	3	4	5 Moderate pain	6	7	8	9	10 Extreme pain

4) How much pain do you have from your arthritis AT THE PRESENT MOMENT?

0 No pain	1	2	3	4	5 Moderate pain	6	7	8	9	10 Extreme pain

Pain Anxiety Symptoms Scale (PASS)-20

Individuals who experience pain develop different ways to respond to that pain. We would like to know what you do or think about when you experience arthritis pain and were planning to do moderate to vigorous exercise during a typical week.

Please use the rating scale below to indicate how often you engage in each of the following thoughts or activities.

(Never) 0 1 2 3 4 5 (Always)

1. I can't think straight when in arthritis pain. _____
2. During painful episodes it is difficult for me to think of anything besides the arthritis pain. _____
3. When I hurt I think about arthritis pain constantly. _____
4. I find it hard to concentrate when I hurt. _____
5. I worry when I am in arthritis pain. _____
6. I go immediately to bed when I feel severe arthritis pain. _____
7. I will stop any activity as soon as I sense arthritis pain coming on. _____
8. As soon as arthritis pain comes on I take medication to reduce it. _____
9. I avoid important activities when I hurt. _____
10. I try to avoid activities that cause arthritis pain. _____
11. I think that if my arthritis pain gets too severe, it will never decrease. _____
12. When I feel arthritis pain I am afraid that something terrible will happen. _____
13. When I feel arthritis pain I think that I might be seriously ill. _____
14. Arthritis pain sensations are terrifying. _____
15. When arthritis pain comes on strong I think that I might become paralyzed or more disabled. _____
16. I begin trembling when engaged in an activity that increases arthritis pain. _____
17. Arthritis pain seems to cause my heart to pound or race. _____
18. When I sense arthritis pain I feel dizzy or faint. _____
19. Arthritis pain makes me nauseous. _____
20. I find it difficult to calm my body down after periods of arthritis pain. _____

Adaptive Self-Regulatory Responses

We are now interested in what you do about your planned moderate to vigorous exercise when you have the experiences and thoughts about your arthritis pain listed above. Those thoughts and experiences are sometimes referred to as 'pain anxiety'.

We would like you to rate the extent to which you do each of the following about your planned exercise when you have pain anxiety?

Please indicate by clicking the number on the scale that is most applicable.

0 Never do this	**1**	**2**	**3**	**4 Do this about half of the time**	**5**	**6**	**7**	**8 Always do this**

1) ALTERNATE the TYPE of EXERCISE that you planned on doing (for example, swim one day, walk another day; do different exercises on the same day).

2) Do ALL OF YOUR SCHEDULED/PLANNED exercise, regardless of your pain anxiety.

3) TAKE PAIN MEDICATION (e.g., ibuprofen, Tylenol, prescriptions, etc.)so that you do exercise as planned.

4) Do LESS EXERCISE than you planned (for example, you exercise for 25 minutes instead of the originally planned 45 minutes).

5) Change the TYPE of EXERCISE you planned (e.g., you choose exercises that are easier on your body, like walking instead of jogging; swimming instead of walking).

6) You make efforts to relax to reduce tension, so that you can exercise.

7) USE HEAT OR ICE before/after your planned exercise**.**

Maladaptive Self-Regulatory Responses

We are now interested in what you do about your planned moderate to vigorous exercise when you have the experiences and thoughts about your arthritis pain listed above. Those thoughts and experiences are sometimes referred to as 'pain anxiety'.

We would like you to rate the extent to which you do each of the following about your planned exercise when you have pain anxiety?

Please indicate by clicking the number on the scale that is most applicable.

0 Never do this	**1**	**2**	**3**	**4 Do this about half of the time**	**5**	**6**	**7**	**8 Always do this**

1) You DO SOMETHING ELSE that you ENJOY (like watch tv, go to a movie, shop, listen to music, etc.).

2) You FEEL LIKE YOU CAN'T GO ON so you STOP doing your planned exercise.

3) You STOP doing ALL of your planned exercise.

4) You ARE OVERWHELMED and you STOP doing your planned exercise.

5) You DO OTHER THINGS WITH YOUR FRIENDS/FAMILY instead of your planned exercise.

Demographics

1) What is the highest level of education that you have completed?

- ☐ No degree, certificate or diploma
- ☐ High school graduation certificate
- ☐ Trades certificate or diploma
- ☐ Community College certificate or diploma
- ☐ University certificate or diploma below bachelor level
- ☐ Bachelor's degree
- ☐ University certificate or diploma above bachelor level
- ☐ Medical degree
- ☐ Master's degree
- ☐ Earned doctorate

2) How tall are you without your shoes? _____feet _____inches OR
____meters ____ centimeters

3) How much do you weigh without your shoes? _____pounds OR ___ kilograms

4) What is your gender? ☐ Female ☐ Male

5) Regardless of your nationality, which of the following best describes your ancestry (choose all that apply)?

- ☐ White
- ☐ Chinese
- ☐ Black
- ☐ Filipino
- ☐ Latin American
- ☐ Southeast Asian
- ☐ South Asian
- ☐ West Asian
- ☐ North American Indian, Metis, or Inuit
- ☐ Arab
- ☐ Other

6) What is your marital status?

☐Married
☐Divorced
☐Widowed
☐Single
☐ Not married, but living with my partner
☐ In a relationship, but not married or living with my partner

7) Are you currently (choose all that apply)?

☐Employed full-time ☐Employed part-time ☐A Homemaker
☐A Student ☐Retired ☐ On Disability
☐Self-employed
☐Out of work for more than 1 year ☐Out of work for less than 1 year

8) What is the approximate range of your household <u>total income</u> from <u>all sources</u>?

☐$0-9,999 ☐$10,000-19,999 ☐$20,000-29,999 ☐$30,000-39,999
☐$40,000-49,999 ☐$50,000-59,999 ☐$60,000-69,999 ☐$70,000-79,999
☐$80,000 or more ☐Do not wish to say

9) Number of years that you have been diagnosed with arthritis?

☐ Less than 1 year ☐1-5 years ☐6-10 years
☐11-15 years ☐16-20 years ☐Over 20 years

10) Are you limited in any way in any activities because of your arthritis?

☐ Yes ☐ No ☐ Don't know

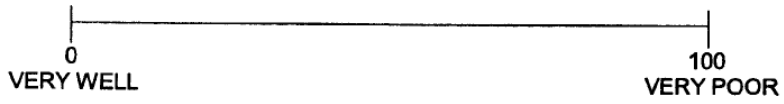
11a) Currently, do you take medication(s) to control your arthritis?

☐ Yes ☐ No

How often are you taking <u>medications in a week</u>?

☐ All days ☐ Most days ☐ Some days ☐ Few days ☐No days

12) Considering all the ways <u>that arthritis affects you</u>, rate how you are doing on the following scale by moving the sliding bar.



13) What medical conditions do you have, other than arthritis (choose all that apply)?

☐Lung Disease
☐High blood pressure
☐Heart disease
☐Diabetes
☐Cancer
☐Other:_____
☐None

Time 2 Survey

Exercise

We would like you to think about the exercise that you did in the **2 weeks** since you did our first survey. As an **ACCURATE REPORTING** of your exercise is one key to our research, please carefully read the following:

Like on the first survey, ONLY think about EXERCISE THAT YOU PLANNED TO DO IN YOUR FREE TIME FOR 20 MINUTES OR MORE. This means that you scheduled/planned it and set time aside in your day to exercise.

Some examples of exercise: You may be registered in a swim/aerobics class at a local gym – this means that you have plans to exercise on each day that your class takes place in a week.

Exercise may also be planned when you get up in the morning – you notice it is nice outside and you plan to walk outside. **The KEY is that you plan to exercise in advance and set time aside in your free time to exercise for 20 minutes or more.**

We understand that you may do other types of exercise, like walking while doing groceries, have a physically demanding job, or you may do planned exercise for less than 20 minutes at one time. These types of exercise are not the focus of our research.

With this in mind, please think about 2 types of planned exercise: **(1) Moderate** and **(2) Vigorous**.

Moderate Exercise makes your heart beat faster and makes you breathe a little harder. You can **TALK EASILY** while doing moderate exercise, but you may not be able to sing comfortably.

Vigorous Exercise makes your heart beat much faster. You may **NOT BE ABLE TO TALK COMFORTABLY** without stopping to catch your breath.

Intensity can be estimated using a scale of 0 to 10, where **sitting is 0 and 10 is the highest level of effort** possible. **Moderate intensity exercise is a 5 or 6. Vigorous intensity exercise is a 7 or 8.**

A) Think about the last 2 weeks (14 days). Did you do any planned moderate or vigorous exercise for at least 20 minutes at one time during your free time?

Yes_____ No_____ (must answer "yes" to participate in prospective primary study purpose arm; “no” moves respondents to the secondary study purpose arm)

On average, how many **days in each 7 day period** (1 week) did you **actually do MODERATE exercise for at least 20 continuous minutes during your free time**?

_____ 0 days in a week
_____ 1 day in a week
_____ 2 days in a week
_____ 3 days in a week
_____ 4 days in a week
_____ 5 days in a week
_____ 6 days in a week
_____ 7 days in a week

How many TOTAL MINUTES were you doing planned moderate exercise **in a typical day**? For example, you may have done two walks of 20 minutes each time during a day – so you would put 40 minutes below. Or you may have walked or done another type of moderate exercise for 35 minutes at one time – so you would put 35 below. We would like you to give us your best estimate of the average amount of time you exercised. For example, if you did 40 minutes on one day and 30 minutes on another day, your average would be 35 minutes.

_____ Total minutes in a typical day (remember – only think about those times when you did 20 or more minutes)

What kinds of moderate exercise did you do (check all that apply)?
_____ Walk
_____ Swimming class
_____ Swim laps
_____ Land-based exercise class
_____ Bike
_____ Other (please write the activity here):_____

Please think about the last 2 weeks (14 days). On average, how many **days in each 7-day period** (1 week) did you **actually do VIGOROUS exercise for at least 20 continuous minutes during your free time**?

_____ 0 days in a week
_____ 1 day in a week
_____ 2 days in a week
_____ 3 days in a week
_____ 4 days in a week
_____ 5 days in a week
_____ 6 days in a week
_____ 7 days in a week

How many TOTAL MINUTES were you doing your planned vigorous exercise **in a typical day**?

_____ Total minutes in a typical day (remember – only report the total time you spent doing vigorous exercise of 20 minutes or more)

What kinds of vigorous exercise did you do (check all that apply)?

_____ Walk
_____ Swimming class
_____ Swim laps
_____ Land-based exercise class
_____ Bike
_____ Other (please write the activity here):_____

APPENDIX D. CORRELATIONS BETWEEN MAIN STUDY VARIABLES

	1	*2*	*3*	*4*	*5*	*6*
1. Pain	-					
2. Pain anxiety	.23***	-				
3. Pain acceptance	-.25***	-.66***	-			
4. Maladaptive self-regulatory responses	.21*	.67***	-.60***	-		
5. Adaptive self-regulatory responses	.28***	.34***	-.39***	.38***	-	
6. Maintenance self-regulatory response	-.07	-.40***	.50***	-.58***	-.34***	-

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