Preoperative Predictors of Pain Following First Trimester Abortion Procedures

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Abstract

Psychological factors which predict post-abortion pain were examined. Women at a local abortion clinic were assessed for anxiety, pain self-efficacy, pain catastrophizing and adult romantic attachment prior to their surgery. Pain was assessed using subjective pain ratings and a standard pain assessment measure at different time periods after the abortion procedure. Results showed that state anxiety (r = .48, p = .01) and trait anxiety (r = .47, p = .01) were correlated with higher pain two weeks following the procedure when assessing pain with the standardized measure. Attachment anxiety was correlated to higher pain ratings using both subjective pain ratings (r = .44, p = .01) and the standard pain questionnaire (r = .47, p = .01) at two weeks following the procedure. Additionally, a small portion of the relationship between attachment anxiety and standard pain scale scores was explained by trait anxiety (F (2, 29) =7.10, p<.03). Results support prior research which indicates that certain psychological factors are associated with postoperative pain. Future research should continue to expand on the pain literature to continue the investigation of predictors of pain following voluntary abortion procedures.

Keywords: abortion, postoperative pain, psychological predictors, anxiety, pain self-efficacy, pain catastrophizing, attachment

Preoperative Predictors of Pain Following First Trimester Abortion Procedures

There has been growing research investigating the link between psychological factors and pain. Psychological predictors of pain associated with surgical procedures have been of particular focus in recent literature (Keogh, Book, Thomas, Giddins, & Eccleston, 2010; Lang, Sorrell, Rodgers, & Lebeck, 2006; Meredith, Strong & Feeney, 2006; Papaioannou et al 2009; Scott, Clum & Peoples, 1983; Sommer at al., 2010; Tremblay & Sullivan, 2010). A number of these studies have investigated how intrapersonal factors, such as anxiety, catastrophizing, and self-efficacy impact pain levels (Hsu et al., 2005; Kalkman et al., 2003; Scott et al., 1983; Sommer et al., 2010). Certain interpersonal factors, such as relationship style and attachment status, have also been studied in relation to pain outcomes (Andrews, Meredith, & Strong, 2011; McWilliams & Asmundson, 2007; Tremblay & Sullivan, 2010). Though past research demonstrates that certain psychological factors impact the physical experience of pain following medical procedures, few studies have examined the relationship between psychological factors and pain following voluntary abortion.

Psychological Factors and the Experience of Pain

Under normal circumstances most acute pain experiences, such as those following surgery or injury, diminish with time. However, some patients experience excess pain or pain that lasts longer then expected (Pasero, 2011). Investigators have sought to determine what factors differentiate those who experience problematic pain (e.g., excessive pain; extended pain) from those who do not. There is considerable research focusing on factors associated with postoperative pain. Postoperative pain is pain felt by a patient following surgery and is the most type of acute pain (Granot & Goldstein, 2005). It has been reported that approximately 30% of postoperative patients report pain scores of 3 or higher on a subjective pain scale ranging from 1

(least pain) to 10 (most pain; Sommer et al., 2010). Other studies have found incidences of moderate to intense postoperative pain despite analgesic treatment (Svenson, Sjostrom, & Haljamae, 2000). Because surgery presents patients with a high stress situation, evoking both emotional and physical reactions, it provides examiners with an opportunity to explore the relationship between interpersonal and intrapersonal variables and pain (Scott at al., 1983).

Identifying those at risk for problematic pain outcomes is important for many reasons. Reducing pain is a goal of medicine in general. Not only does reducing high postoperative pain decrease patient discomfort and the use of medical resources, but effective postoperative pain management has been shown to reduce the risk for chronic pain (Sommer et al., 2010). Identifying factors associated with poorer pain outcomes following surgery may aid in developing pre-surgery interventions, minimizing the need for additional medical or pharmacological treatments (Scott et al., 1983). Much of this research has focused on theory-driven explanations that link psychological factors to the experience of pain.

Recent theoretical models propose that the pain following medical procedures involves a complex interaction between physiological, psychological, and social components (Belanger, Melzack, & Lauzon, 1989; Renner, Jensen, Nichols, & Edelman 2010). The gate-control theory of pain (Melzack, 1996), which states that the transmission of nerve impulses carrying pain information from the spine to the brain is controlled by a gated system, can help explain this phenomenon. This theory hypothesizes that the gate which increases or decreases the flow of nerve impulses can be affected by psychological factors. For example, certain emotional or cognitive states, such as anxiety, can allow the gates to “open” in the spinal core which allows pain signals to travel more easily to the brain (Mennuti-Washburn, 2007). Psychological factors may also influence the activity of nocieptors, which are sensory receptors that cause pain when

stimulated (Dickenson, 2002). This theory would suggest that different individuals may experience the same painful situation differently depending on the combination of co-occurring physical and psychological factors (Kotzer, 2000). Psychological factors such as anxiety, catastrophizing, and self-efficacy not only impacts the way pain is transmitted through the body, but also impacts that way one perceives a potentially painful event. Thus, according to gate-control theory, psychological factors may influence individuals' *pain thresholds* and *pain sensitivity* by increasing nociceptor activity and increasing the ease with which spinal gates open (Dickenson, 2002). For example, Individuals who have higher anxiety and more catastrophic thinking, tend to view potentially painful situations, like surgery, in a more negative and potentially harmful way. These individuals in turn experience more intense pain and greater functional disability post-surgery (Nicholas, 2007; Porter, Davis, & Keefe, 2007; Scott et al., 1983; Sullivan, Bishop, & Pivik 1995). Anxiety, pain catastrophizing, self-efficacy, and interpersonal variables have all been linked to pain following medical procedures and chronic pain. Of equal importance, psychological interventions focusing on these factors have been shown to reduce the experience of pain (Caudill, 2001). Taken as a whole, this literature is generally supportive of gate-control theory, especially the hypothesis that psychological factors influence the physical experience of pain.

Anxiety and Pain

One of the most commonly investigated psychological predictors of pain is anxiety (Lang et al., 2006; Meredith et al., 2006). Anxiety influences pain in several ways. High anxiety may increase apprehension and stress prior to a medical procedure increasing the risk for greater pain. After the procedure, high anxiety may be associated with more frequent body scanning, greater pain sensitivity, and a greater tendency to label physical sensations as painful (McManus, 2007).

Consistent with Gate-control theory, anxiety can increase the ease with which gates open and can increase the rate of transmission. Research shows that anxiety plays a role in postoperative pain, chronic pain, and acute pain.

Between 11% and 80% of patients experience anxiety prior to surgery depending on the method of assessment (Nielsen et al., 2007), suggesting that surgery may be able to induce anxiety even among those who are not prone to anxiety in general. Some individuals may experience situational anxiety during medical procedures. This type of anxiety has been labeled by Charles Spielberger (1991) as *state anxiety*. State anxiety is a reaction to an immediate threat which dissipates once the immediate threat is removed and is no longer posing a perceived danger to the individual (Spielberger & Rickman, 1991). State anxiety prior to medical procedures has been linked to the pain outcomes post-procedure. For example, patients' state anxiety levels prior to a gallbladder removal surgery were predictive of postoperative pain up to five days following the surgery (Scott et al., 1983).

Some individuals experience anxiety chronically across different types of situations. Spielberger (1991) has referred to this general predisposition towards anxiety as *trait anxiety*. Unlike state anxiety, trait anxiety involves more chronic physiological arousal and worry that does not tend to dissipate over time, almost acting as a personality characteristic. Individuals with higher trait anxiety tend to evaluate situations as more threatening than those with lower trait anxiety (Spielberger & Rickman, 1991). Research on trait anxiety and pain outcomes is mixed, with some investigators finding a relationship between the two. For example, in a study looking at pregnant women's anxiety prior to childbirth, trait anxiety showed a significant association with labor pain (Lang et al., 2006). It is also possible that trait anxiety predisposes an

individual to greater state anxiety in response to a medical procedure which, in turn, increases risk (Granot & Goldstein, 2005).

The role of state and trait anxiety in postoperative pain experiences has been examined in multiple studies. Hsu et al. (2005) examined pain outcomes in forty women undergoing a hysterectomy or myomectomy under general anesthesia in a Taiwan hospital. A Chinese version of the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1964; Spielberger, 1977) was given to patients prior to entering the operating room. This questionnaire is one of the most widely used assessments of anxiety and has consistent reliability in predicting medical related acute and chronic pain (Endler and Kocovski, 2001; Groot, Boeke, Duivenvoorden, Bonke, & Passchier, 1996; Kain et al., 2000; McManus, 2007). Post-operative pain was assessed once the patient arrived in the post-anesthesia care unit using the Visual Analogue Scale ruler and then again at 24 hours post-surgery. The Visual Analogue Scale ruler is a pain assessment technique in which patients mark on a line ranging from 0 to 100, the amount of pain they are experiencing. Using participants' state anxiety scores, women were divided into two groups characterized as highly anxious or mildly anxious. The researchers found that postoperative pain ratings immediately following surgery were significantly higher for women classified as highly anxious as compared to those labeled as mildly anxious. Additionally, highly anxious patients had a higher demand and delivery of pain medications directly after the surgery compared to mildly anxious patients. However, at 24 hours post surgery, neither pain ratings nor medication demand were significantly different between the two groups of women.

Preoperative anxiety levels have also been linked to post-operative pain reports in children undergoing routine surgical procedures. In a study by Kain, Mayes, Caldwell-Andrews, Karas, & McClain (2006), a group of 241 children undergoing tonsillectomy and adenoidectomy

were assessed. Prior to surgery, both parental and self-report measures of anxiety were used, including ratings of the STAI (provided by parents) and the Modified Yale Preoperative Anxiety Scale (mYPAS; Kain, Mayes, & Cicchetti, 1995). Both the Postoperative Pain Measure for Parents (PPMP; Chambers, Reid, McGrath, & Finley, 1997) and the Bieri Faces Scale (Bieri, Reeve, Champion, Assicoat, & Ziegler, 1990) were used to assess postoperative pain. Additionally, data on analgesic consumption and postoperative behavioral recovery was collected from nurses and parents. Using preoperative anxiety scores provided by the mYPAS, a state anxiety measure specifically tapping anxiety about surgery, children were labeled as "high-anxiety" or "low-anxiety." "High-anxiety" children scored significantly higher on state anxiety then the "low-anxiety" group. Children labeled as "high-anxiety" were observed to have higher levels of pain by parents with a slower decline of pain than those in a "low-anxiety" group. Even after one hour of receiving pain medication, the high-anxiety children self-reported higher levels of pain than low-anxiety children both in the hospital and at home (Kain et al., 2006).

State anxiety, however, may not be associated with greater pain for all situations. For example, trait anxiety may be particularly important when pain outcomes are expected to require more lengthy recovery times or in response to highly emotional medical experiences, such as childbirth. Lang et al. (2006) investigated the relationship between pain intensity and anxiety sensitivity prior to labor. Anxiety sensitivity can cause individuals to "over respond" to physiological sensations leading to fear and avoidance of painful situations (Lang et al., 2006). The study looked at 35 pregnant women and used the STAI (Spielberger, 1977) and the Anxiety Sensitivity Index (ASI; Peterson & Reiss, 1993) to assess anxiety prior to their birthing experiences. Women were then evaluated for level of pain using a Likert scale method and the McGill Pain Questionnaire (MPQ; Melzack, 1984) following the delivery. The MPQ assesses

sensory and affective dimensions of pain using a rating system based on current pain severity. Women were asked to rate the pain they had experienced during labor. Anxiety sensitivity and trait anxiety were both significant predictors of higher pain ratings during labor (Lang et al, 2006). Although slightly different than past findings (Kain, Sevarino, Alexander, Pincus, Mayes, 2000; Reading & Cox, 1985; Scott at al., 1983) where state anxiety, rather than trait anxiety, was predictive of pain in acute pain settings, these findings still support anxiety's overall impact on pain perception.

Anxiety has been shown to play a role in the pain experience of chronic pain patients as well. In a study by Meredith et al. (2006), 152 chronic pain patients were enlisted at a pain rehabilitation center. Participants were given several self-report questionnaires, including the Depression Anxiety Stress Scale-21 (DAS-21; Lovibond & Lovibond, 1993) to assess anxiety levels. The DAS-21 assesses trait anxiety. Pain outcomes were assessed using the VAS. Individuals with higher trait anxiety levels on the DAS-21 tended to have poorer pain outcomes and greater functional impairment. In this study, anxiety was also shown to mediate the relationship between other psychological predictors (such as low pain self-efficacy, insecure attachment styles, and perceived disability) and pain (Meredith et al., 2006).

Anxiety may also influence the development of chronic pain following acute pain. This is of increasing interest in current medical research. One study recruited 35 patients scheduled for nephrectomy (surgical removal of the kidney). Examiners created a preoperative questionnaire to collect data on sociodemographic variables, hospital anxiety, quality of life, affect, psychosomatic functioning, physical and mental co-morbid conditions, current level of pain, pain chronicity and severity, and presence of neuropathic pain. This preoperative questionnaire was administered to patients 1-2 days prior to surgery. At the time of discharge and

throughout the first week following surgery, average and "worst pain" intensities were gathered at rest and during movement (i.e. sitting or standing up) on a daily basis. Total Neuropathic Pain Scale scores were calculated on days 2, 4 and 6 following the surgery. Follow up questionnaires re-evaluating psychological and pain variables were sent to patients 3 and 6 months after surgery. Hospital anxiety was the only pre-surgical variable which correlated significantly with neuropathic pain intensity ratings on all three days. Patients who indicated pain related disability prior to surgery also reported more severe pain ratings on day 2 and 4. Additionally, patients who scored higher on a chronic pain indicator 3 months following the surgery had significantly higher preoperative anxiety scores. Those who had higher pain ratings also listed more co-morbidities and had more disability due to their illness as compared to those scoring low on the chronic pain indicator (Gerbershagen at al., 2009). These findings demonstrate that preoperative risk factors may have potential utility for not only detecting those at risk for acute pain experiences, but also for those at risk for the development of more chronic pain conditions following medical procedures.

Anxiety has also been shown to impact pain experiences in acute injuries. Acute pain treatment settings offer researchers the opportunity for patients to report on their short-term pain and functional loss without the added psychological conditions often associated with the chronic pain, such as clinical depression or anxiety. One such study (Keogh et al., 2010) was performed in a hand fracture clinic where patients experience both acute pain and loss of function. A total of 87 patients, both male and female, were evaluated for anxiety sensitivity, pain anxiety, pain catastrophizing and mood. Predictor variables were measured using the Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & Mcnally, 1986), Pain Anxiety Symptom Scale (PASS; McCracken, Zayfert, Gross, 1992), Pain Catastrophizing Scale (PCS; Sullivan et al, 1995), and

Depression Anxiety Stress Scale (DASS; Lovibond & Lovibond, 1993, 1995). Current and task related pain were assessed with the Short-form McGill Pain Questionnaire (SF-MPQ; Melzack, 1987). Anxiety measured by all anxiety scales (ASI, PASS and DASS) was significantly correlated to current pain. Pain anxiety and catastrophizing were the only measures which significantly correlated to task-related pain. Though significantly correlated to pain, the variance explained by pain anxiety, anxiety sensitivity, and pain catastrophizing was modest (current pain $R^2 = .19$, task-related pain $R^2 = .20$; Keogh et al., 2010).

These studies generally show expected relationships between anxiety and subjective pain experiences, however, there are limitations. Pain ratings were only collected once after the injury or medical event. It would be beneficial to collect several pain ratings across a span of time to determine if the relationship between anxiety and pain ratings remained once the initial threat was eliminated.

Self-Efficacy and Pain

An individual's confidence in their ability to cope with certain painful experiences has also been associated with how one experiences pain. An individual's judgment of pain tolerance and their ability to function despite pain has been labeled *Pain Self-Efficacy* (Nicholas, 2007). Bandura's (1977) theory of self-efficacy states that the way one perceives their ability to perform will determine how much energy they commit to a task and how long they will tolerate that task. Pain self-efficacy beliefs explain how an individual reacts, both emotionally and behaviorally, to pain (Nicholas, 2007). As would be expected, pain self-efficacy plays an important role in the experience of chronic pain. In one comprehensive study, chronic pain patients were assessed four times over a 9 month period. They completed questionnaires measuring pain intensity, personality dimensions, pain related beliefs (including pain self-efficacy, catastrophizing,

disability, depression) and pain behaviors. Although researchers did not calculate correlations between pain intensity and pain self-efficacy directly, they did evaluate how pain behavior over time was correlated with a baseline measure of pain self-efficacy. Pain behaviors were defined as avoidance, verbal and non-verbal complaints about pain, and help seeking behaviors. Results showed that pain self-efficacy scores were negatively correlated to pain behaviors at every follow-up time interval, meaning that the more self- efficacy participants had regarding their ability to cope with pain the less pain behaviors they reported (Asghari & Nicholas, 2001). These results support the theory that people who have stronger pain self- efficacy beliefs cope and perform better during painful experiences.

The role of pain self-efficacy has also been studied in relation to acute pain experiences, such as postoperative pain. In a study of 120 hand surgery patients, participants were assessed for depression, pain self-efficacy, pain anxiety and pain catastrophizing prior to their surgical procedures. Both before and approximately 10 to 14 days following surgery, participants were assessed for disability in the upper extremities and pain intensity. Results showed that post-surgery pain intensity correlated significantly with all pre-surgery measures (depression, pain self-efficacy, pain, anxiety and pain catastrophizing). However when entered together into a multiple regression, depression was the only factor which uniquely predicted pain intensity. Both depressive symptoms and pain self-efficacy correlated with post-operative disability (Vranceanu, Jupiter, Mudgal & Ring, 2010). Although these results are somewhat mixed, it opens the door for further investigation on self-efficacy's effects on pain in surgical populations.

Pain Catastrophizing

Catastrophizing, in general, is holding an exaggerated negative mental set towards potentially threatening objects or situations (Sullivan, Stanish, Waite, Sullivan, & Tripp, 1995).

Pain Catastrophizing is when these exaggerated beliefs apply to pain or painful situations. Individual's who catastrophize about pain tend to focus excessively on the pain, exaggerate its threat and view themselves as helpless to control it (Wade, Riddle, Price & Dumenci, 2011). Much of the current pain literature has linked high levels of pain catastrophizing to higher self-reported pain and disability across a number of experiences and conditions (Flink, Mroczek, Sullivan, & Linton, 2009; Granot & Ferber, 2005; Keefe, Brown, Wallston, & Caldwell, 1989; Keogh et al., 2010; Khan at al., 2011; Marc at al, 2007; Papaioannou at al., 2009; Pavlin, Sullivan, Freund & Roesen, 2005; Sullivan et al., 1998; Wade et al, 2011; Weissman-Fogel, Sprecher, & Pud, 2008).

This association has been found in studies using experimental manipulation to create pain. One such study, including 48 healthy participants, looked at how level of pain catastrophizing influenced heat pain intensity. Participants filled out the Pain Catastrophizing Scale (PCS; Sullivan et al., 1995) prior to a heat stimulation task performed on their non-dominant hand. The PCS is used to assess individual's thought patterns and feelings during times of physical pain. During the one minute heat stimulation task, participants were asked to rate their pain intensity at four different times as the temperature increased. Then participants were asked to use a hand grip devise to induce pain themselves on their non-dominant hand and to rate pain accordingly. PCS scores and pain scores on both pain stimulation procedures were positively correlated. (Weissman-Fogel et al., 2008).

Pain catastrophizing has also been studied in samples of patients with chronic pain. In a study looking at 223 patients diagnosed with rheumatoid arthritis, participants filled out a series of mailed questionnaires at two different times. Participants completed a catastrophizing scale, a physical disability scale, a depression measure, and a scale measuring pain. Participants who had

higher catastrophizing scores not only showed higher pain ratings, but had higher scores on the impairment and depression measures (Keefe et al., 1989). In a similar study, a group of 310 chronic knee pain patients were assessed prior to total knee arthroscopy. Participants filled out questionnaires to assess pain intensity, unpleasantness and negative emotions associated with pain, as well as the PCS to measure pain catastrophizing. Results showed that the relationship between pain intensity and pain related suffering are significantly mediated by catastrophizing. (Wade et al., 2011).

Researchers have recently begun to look at catastrophizing's role in postoperative pain experiences. In a 2005 study by Pavlin et al., 48 patients undergoing ACL reparative surgery were asked to complete the PCS prior to their surgery. They then rated their "worst" pain level immediately following the surgery and at 24 hours post-surgery. At 48 hours and at 7 days post-surgery, patients rated their pain, analgesic use in the last 24 hours, and pain control satisfaction. Pre-operative pain catastrophizing significantly predicted pain ratings immediately following surgery and at 7 days after surgery, but not at 24 and 48 hours post-surgery (Pavlin et al., 2005).

In a similar study, participants who were undergoing lumbar fusion surgery were recruited. Participants were asked to complete the PCS and the Hospital Anxiety and Depression Scale (HADS: Zigmond & Snaith, 1983) one day prior to the surgery. At one and two days following the surgery, participants rated pain intensity at rest and during activity every 6 hours. Analgesic use was also obtained from medical records. Catastrophizing showed was significantly positively related to pain intensity and analgesic use after surgery. Additionally, regression analysis showed that pain catastrophizing was a unique predictor of pain during activity (Papaioannou at al., 2009).

Adult Romantic Attachment and Pain

Psychological variables associated with emotion regulation and interpersonal functioning have also been useful in predicting pain outcomes. Adult romantic attachment has emerged as an important personality component associated with how individuals regulate emotions and manage distress (Mikulincer & Shaver, 2007). Adult attachment is conceptualized along two dimensions: attachment anxiety and attachment avoidance. Attachment anxiety involves chronic fears of rejection or abandonment mixed with excessive attempts to maintain closeness (emotionally and physically) with others. Individuals high in attachment anxiety tend to need excessive approval from others and experience significant distress when their partner is not able or unavailable to provide emotional support. They tend to have a negative self-view and experience more frequent negative emotions in general. Attachment avoidance, in contrast, entails difficulty depending on others, discomfort with emotional closeness, and a strong desire to be independent. Those high in attachment avoidance fear intimacy with others, rarely turn to others for support or assistance, and tend to suppress emotional distress (Wei, Russell, Mallinckrodt, & Vogel, 2007).

A small number of studies have linked adult attachment dimensions to pain. In an experimental pain study looking at the link between attachment and pain intensity, participants engaged in a cold presser test where they submerged an arm in cold water to elicit a pain experience. Participants filled out questionnaires assessing relationship style, depression and anxiety, and personality prior to the test. Pain threshold, tolerance, and intensity were measured during the procedure. Fearful attachment styles (i.e., high attachment anxiety and high attachment avoidance) predicted pain intensity, but did not show significant relationships with pain threshold or tolerance (Andrews at al., 2011).

Tremblay and Sullivan (2010) conducted a study focusing on attachment and adolescent's reactions to painful situations they have experienced. A sample of 382 students

from a Montreal high school were given several self-report instruments assessing a wide variety of psychological variables. Anxiety was measured using a French version of the STAI, attachment styles were assessed using the Adolescent Relationship Scale Questionnaire (Scharfe & Bartholomew, 1995), and pain was measured using a questionnaire developed by the examiners with questions based on the Pain Experience Interview (PEI; McGrath et al., 2000). Results indicated that attachment insecurity was associated with higher pain intensity in general. The relationship between attachment insecurity and pain was mediated by anxiety. This result suggests that it is the anxiety component of attachment insecurity which is most likely to be predictive of pain (Tremblay & Sullivan, 2010).

Studies Using Multi-variate Predictors of Pain

While most studies focus on one psychological predictor and its impact on the pain outcome, more recent studies have begun investigate how the interplay between multiple variables affects pain. This allows researchers to not only investigate direct relationships between predictors and pain, but also how mediating factors influence the relationship. One of the most recent and conclusive studies looking at multiple predictors of post-operative pain used a comprehensive set of evaluative measures assessing both somatic and psychological variables (Sommer et al., 2010). A total of 1490 adult patients were assessed prior to various types of surgery at the University Hospital Maastricht in The Netherlands. Categories of surgery included general, plastic, ear-nose-throat, facio-maxillary, neurology, thoracic, orthopedics, ophthalmology, gynecology, and urology. Patients were given a series of questionnaires assessing a number of psychological factors including pain catastrophizing, anxiety, optimism, and self-efficacy. Additionally, patients completed questionnaires on demographics and surgical fear immediately prior to their surgery. Following surgery, patients were asked to assess their

pain at one and three hours postoperatively, as well as prior to going to sleep that night. On days 1 to 4 following the surgery, patients were asked to record pain in a pain diary 3 times a day. Surgeries were categorized according to anticipated level of postoperative pain and pharmacological pain intervention was monitored. Results showed that expected pain increased the risk of post-operative pain at all time points following the surgery. Patients who scored high on the short-term fear measure were more at risk for pain immediately following the procedure, whereas patients who scored higher on the long-term fear scale were associated with greater pain ratings on days 1 through 3. Scoring higher on pain catastrophizing was linked to higher pain ratings days 2 through 4. Additionally, general self- efficacy was inversely correlated with pain experiences at day 4. An unexpected result was that trait anxiety actually decreased the risk of pain following the surgery. However, this finding was only significant on the day of the procedure. (Sommer et al., 2010).

Multiple factors have also been found to impact chronic pain. A study by Meredith at al. (2006) looked at how attachment, anxiety, and pain self-efficacy impacts pain intensity and disability. It was hypothesized that pain self-efficacy and anxiety would predict variance in pain intensity and disability. A total of 152 chronic pain patients were assessed using existing medical files. Anxiety and pain self-efficacy accounted for 22% of variance when it came to pain intensity. Additionally, pain self-efficacy accounted for 30% of variance when looking at its impact on disability (Meredith et al., 2006).

Predictors of Post-Abortion Pain

A significant gap in the pain literature exists concerning how psychological factors impact post-abortion pain. Elective first trimester abortions are one of the most common outpatient surgical procedures performed in the United States, with more than 1.2 million

reported abortions in 1996 (Renner et al., 2010; Lichenberg et al., 2001). Currently, one in three pregnant women in America choose abortion (Singh et al., 2008), with 43% of women getting an abortion at least once in their lifetime by age 45 (Lichtenberg, Paul, & Jones, 2001). Although abortion is a safe legal option for women faced with an unwanted pregnancy, it is still highly stigmatized and underrepresented in medical research. Most women experience at least a mild to moderate degree of pain both during and following an abortion procedure (Belanger et al, 1989; Renner et al., 2010). Some women also experience anxiety regarding the procedure, fear of possible risks, and difficulty in making the decision to terminate a pregnancy (Braken, 1978; Harris, 2004). Since the decision to have an abortion involves many of the same psychological factors that have been linked to increased pain in past research, it seems necessary to investigate this link as it relates to the abortion procedure itself.

The most common method of post abortion pain control involves pharmacological interventions, such as non-narcotic or anti-inflammatory pain medications (Lichtenberg et al., 2001; Wiebe & Rawling, 1995). However, much of the available abortion pain research indicates that psychological intervention and preparation prior to the abortion procedure may be equally important in improving pain outcomes following the surgery (Stubblefield, 1989). Identifying which women may be at potential risk for increased pain following an abortion using these psychological criteria may offer opportunities to create appropriate pre-abortion counseling tools. These interventions can aid in reducing painful outcomes and decreasing the risk and cost involved with using pharmacological interventions (Stubblefield, 1989).

Most knowledge about pain intensity during and following an abortion procedure comes from self- report pain ratings or observer estimates of a patient's pain (Belanger, 1989). Instruments such as the Visual Analog Scale (VAS) and the McGill Pain Questionnaire (MPQ)

are now widely used in pain research (Belenger, 1989; Singh at al., 2008). As methods for better assessing patient pain have advanced, interest in identifying factors, including psychological factors, associated with pain outcomes has also increased. The abortion literature is beginning to focus more on medical, psychological, and social factors connected to the pain experience. Belanger et al. (1989) conducted one such study in a health clinic in Montreal. A sample of 109 women undergoing an abortion at the clinic participated in the study. Consenting women completed a pre-abortion assessment, including the STAI and the Beck Depression Inventory (BDI). They were also asked questions pertaining to the decision process leading up to the abortion, ambivalence regarding the decision, concerns about the procedure, pain expectancy and tolerance, and level of social support (measured by the presence of a support person at the appointment). Patients' medical and demographic information was collected through a structured interview. Patients had an abortion procedure performed under local anesthesia and were accompanied by a nurse throughout the surgery. Each patient was assessed for pain after the abortion while in the recovery area using a post-abortion questionnaire. This questionnaire included the McGill Pain Questionnaire, VAS, and verbal pain intensity scales. Women were also questioned about their level of distress and their perceived quality of care. Additionally, clinic staff members rated each patient's level of pain and distress. Overall, age and education accounted for the most variance in pain ratings, with adolescents reporting more severe pain than adults. Beyond age and education, results show that depression and anxiety (state and trait) accounted for more severe pain ratings. Factors such as moral dilemmas with abortion and lower pain tolerance were marginally significant predictors of pain level as well. Social support was unrelated. Some medical factors, such as a retroverted uterus, menstrual problems, and gestational age also accounted for individual differences in pain responses (Belanger, 1989).

Although this study is dated and has limitations, such as a correlational design, it offers the most comprehensive investigation and conclusive results of the various psychological correlates of post-abortion pain in medial research thus far.

A similar study was more recently conducted using abortion pain as clinical focus. (Singh et al., 2008). However, this study focused more on the pain during the procedure as opposed to post abortion pain. Additionally, researchers used demographic variables and aspects of the abortion experience itself instead of formalized psychological assessments as potential predictors of abortion pain. Family planning clinics in several cities across the United States recruited women who sought to have a first trimester abortion procedure. Women were asked to complete a pre-procedure packet of questionnaires which looked at demographic factors (i.e. marital status, education, previous pregnancies, and contraceptive use), social factors (i.e. level of partner involvement and comfort with abortion decision) and questions regarding certain fears women had regarding the surgery (i.e. fear of surgery itself, fear of pelvic exams, anticipated pain, anxiety and bleeding during the procedure). The women were then randomly assigned to either have a manual vacuum aspiration (MVA) or and electric vacuum aspiration (EVA); both safe methods of abortion which meet quality standards of care in the medical field. Using the VAS and Likert ratings, women were asked to recall their pain level during to procedure immediately after their abortion. They were also asked to recall the level of pain they felt during the procedure at a 30 minute and 2-4 week follow up. Physicians and patient advocates (i.e. clinic staff) were also asked to rate what they perceived the patient's level of pain was during the procedure, immediately following and 30 minutes after the abortion was complete. VAS pain scores did not significantly differ across demographic, social, or psychological variables at any of the assessment periods. Using the Likert Scale, however, women's expectations of moderate

to severe bleeding during the procedure were predictive of increased pain at the 30 minute follow up. Women who did not report fear of pelvic exams were less likely to report moderate to high pain at both the 30 minute and 2-4 week follow up. At the 2-4 week follow up, divorced and never married women reported more pain compared to married women. There was consistency between pain ratings of patient's and advocates at the 30 minute follow up, however physicians tended to rate the patient's pain lower than the woman's self-report score. Finally, there were no pain score differences between women in the EVA and MVA procedures (Singh et al., 2008).

Although this study mildly suggests that a woman's expectations regarding the abortion experience can impact her perception of pain, it doesn't address the idea that specific psychological variables (i.e. anxiety, self-efficacy, catastrophizing or attachment) could be playing a part in the physical symptoms of abortion. The authors of this study suggest that these results can be used to design interventions to address certain demographic features, lack or support or the fear women feel when faced with this procedure. Although the construct of "anxiety" was not explicitly used in this study, there were efforts to assess fear.

The most recent study in the abortion literature that specifically addresses psychological predictors of pain involves state-trait anxiety. Pud and Amit (2005) assessed forty women undergoing a first trimester abortion at the Israel medical center for anxiety one hour prior to their surgery using a Hebrew version of the STAI. Following the abortion, participant's pain was assessed using a VAS ruler at 15 minutes, 30 minutes and 60 minutes post-abortion. State anxiety predicted higher VAS pain ratings at the 15 minute post-surgery interval; however trait anxiety better predicted high VAS scores at later follow up intervals (30 minute). These results are consistent with the state/trait theory of anxiety and past research showing that state anxiety is

more predictive of immediate postoperative pain, where trait anxiety may account for more persistent, longer lasting pain.

Present Study

There is a significant gap in the literature related to the influence of psychological variables on pain following an abortion procedure. Factors such as anxiety, pain self-efficacy, pain catastrophizing and adult romantic attachment have been thoroughly examined across many procedures with the exception on abortion. Although, abortion is a controversial issue to many, it offers pain researchers an opportunity to investigate the link between psychological predictor variables and pain in an emotionally charged situation. Research in this domain may shed light on how to improve pain outcomes after abortion procedures. Determining what impacts pain intensity for women after having an abortion can lead to better assessment of risk factors prior to surgery. It will also inform interventions or coping strategies that can be implemented before a poor pain outcome is reached. Unfortunately, however, most of the research investigating variation in abortion outcomes is aimed at women's emotional responses and not the physical pain in and of itself. There is very limited research on how a women's pain intensity during and following abortion is impacted by psychological, emotional, psychosocial, demographic and medical variables.

The current study aims to expand on the current pain research to identify which risk factors correlate with increased pain levels following an elective first trimester abortion procedure. With the extreme lack of research on predictors of post-abortion pain, this study is important. The goal of this study is to apply what has been learned from research on psychological predictors of pain to the abortion realm. Based on prior findings, the current study hypothesizes:

H_1 Higher state anxiety ratings prior to an abortion procedure will be associated with higher reported pain post-abortion at time 1 (immediately following the procedure)

H_2: Higher trait anxiety ratings prior to an abortion procedure will be associated with higher reported pain post-abortion at time 2 (day following procedure) and time 3 (two weeks following procedure)

H_3 Higher levels of attachment anxiety will be associated with high levels of pain at all time intervals.

H_4. Based on the research described above, it is anticipated that state anxiety ratings will mediate the relationship between attachment anxiety and negative pain outcomes at time 1.

H_5 It is expected that trait anxiety will mediate the relationship between attachment anxiety and negative pain outcomes at time 2 and time 3

In addition to the apriori hypotheses above, the present research will also continue to examine other factors on an exploratory basis. For example, prior research focusing on the role of state vs. trait anxiety for prediction of pain outcomes has been mixed. Thus, an examination of the relationship between state and trait anxiety will be included.

Method

Participants

Ninety women (M_{age}=25.9, age range: 18-44 years), recruited from Northland Family Planning Center in Sterling Heights, MI, agreed to participate in this IRB approved study. However, because of researcher error and attrition, only 64 women were included in Time 1 data, 35 in Time 2 data and 32 in Time 3 data. Women were included if they were in their first trimester of pregnancy (12 weeks and under), over the age of 18 and were able to speak and read the English language. The sample consisted of 66 (73.3%) women identifying as Caucasian or

White, 17 (18.9%) women identifying as African American, four (4.4%) as Hispanic, one (1.1%) as Asian, and two (2.2%) women were unidentified. Seventy one (78.9%) of the women included reported they were single, 12 (13.3%) reported being married, four (4.4%) separated, one (1.1%) divorced, one (1.1%) engaged and one (1.1%) did not report a marital status. Within the sample, 64 (71.1%) women reported being employed, 19 (21.1%) reported being unemployed, six (6.7%) reported being a student and one (1.1%) did not report any employment status. Of the women who participated, 44 (48.8%) received fentanyl sedation during the procedure, 38 (42.2%) received the stronger combination medication (CM) and four (4.4%) did not receive sedation during their abortion procedure. Follow up pain data at time 1 was available from 63 (70%) of the 90 women. Follow up data at time 2 was available from 36 (40%) and at time 3 from 32 (35.6%) of the 90 women who participated. Demographic data for the current sample are presented in Table 1.

Measures

Pain Self-efficacy Questionnaire (PSEQ; M.K. Nicholas, 1989). This is a 10 item scale which assesses how confident an individual is they can perform certain activities despite being in pain. Items are rated on a 6-point scale with higher scores indicating greater confidence. The PSEQ was used as a pre-surgery measure to get a baseline measure of how well an individual can typically perform the activities. An additional question (b) was added to each original question (a) on the PSEQ given to participants prior to surgery to assess how well the participant can complete the task when not experiencing pain. The pre-abortion questionnaire was be labeled PSEQ-Modified. Participants also completed the questionnaire post-surgery to indicate how much the pain they were experiencing impacted their ability to perform these same activities. The PSEQ post-abortion remained unchanged and was labeled PSEQ-Standard. The PSEQ is

widely used for assessment, treatment planning and outcome evaluation for persistent pain presentations. It assesses for a wide range of daily functions, including household chores, social situations, and work abilities. A high PSEQ score indicates a high level of belief that one is able to engage in these activities successfully despite pain. Low scores usually indicate someone with little confidence they can accomplish daily life tasks and is a good predictor of disability and depression. The measure has good psychometric properties and is considered to be a reliable (.92 Chronbach's α) and valid measure (Meredith et al., 2006; Nicholas, 1989, 2007; Tonkin, 2008; Vong, Cheing, Chan, Chan, & Leung, 2009). In the present sample, the measure showed internal consistency with a Chronbach's α of .93 for the modified version and .97 for the standard version. The average corrected item-total correlation was .66 for the modified version of the PSEQ in this sample and .86 for the standard version.

State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1964). This is a 40 item self- report questionnaire which measures level of anxiety in adults. The measure differentiates between a temporary, situational type of anxiety (state) and a more long lasting, characteristic type of anxiety (trait). The STAI uses 20 questions assessing state anxiety and 20 questions assessing trait anxiety. Individuals rated each statement on a 4-point scale. A higher score indicates a higher agreement with a statement. The STAI is one of the leading measures for personal anxiety in research. Reliability coefficients vary depending on the scale being used (i.e. state or trait). The Trait-anxiety scale's alpha coefficients range from .65 to .86, whereas the State-anxiety scale ranges from .16 to .62. The low Chronbach's alpha of the State-anxiety scale is explained by the varying influence of situational factors surrounding the testing situation (Pud & Amit, 2005; Scott at al., 1983; Spielberger, 1977, 1991, 1995; Tremblay & Sullivan, 2010). For the current sample, the Trait-anxiety scale showed a Chronbach's alpha of .90 and an

average corrected item total correlation of .53. The State-anxiety scale within this sample had a Chronbach's alpha of .93 and an average corrected item total correlation of .61.

Experiences in Close Relationships Scale-Short Form (ECR-S; Wei et al., 2007). This is a 12-item condensed version of the Experiences in Close Relationship Scale (ECR; Brennan, Clark and Shaver, 1998). The ECR-S measures how an individual generally experiences romantic relationships. The statements are designed to assess two dimensions of adult attachment: Anxiety and Avoidance. Attachment anxiety involves having fear of being rejected or abandoned by one's partner. Attachment avoidance involves being fearful of interpersonal intimacy and having an overwhelming need for independence. Statements are rated on a 7-point Likert scale with higher ratings reflecting more agreement with the statement. A high score on either of the dimensions reflect an insecure adult attachment style. This measure in its shortened form is convenient for use and has shown to have equal validity and reliability to the original ECR measure (Brennan et al., 1998; Fraley, Waller, & Brennan, 2000: Lo et al., 2009: Wei et al., 2007) The coefficients alphas for the ECR-S are .78 for the Anxious subscale and .84 for the Avoidance subscale (Wei et al., 2007). Within the present study's sample, the Chronbach's alpha is .74 and the average corrected item total correlation is .50 for the Anxious subscale and .75 and .50 for the Avoidance subscale.

Pain Catastophizing Scale (PCS; Sullivan et al., 1995). This 13-item measure assesses an individual's thoughts and feelings during times of physical pain. Statements are designed to assess thought patterns associated with catastrophizing: rumination about pain, magnifying pain and feeling helpless to manage pain. Individuals were asked to rate statements on a 5-point scale in relation to how often they experience them. The PCS is one of the most widely used measures of catastrophizing pain experiences and is highly reliable and valid. (Keogh et al., 2010;

Papaioannou et al., 2009; Sullivan et al., 1995; Tremblay & Sullivan, 2010) Overall, the PCS shows coefficient alphas of .87. For the various subscales, coefficient alphas are .87 for Rumination, .66 for Magnification and .78 for Helplessness (Sullivan et al., 1995). In the current study, the overall Chronbach's alpha for the PCS is .94. Subscale alphas for the current sample are .88 for Rumination, .75 for Magnification and .92 for Helplessness. The average corrected item total correlation is .73 for the PCS as a whole, .75 for the Rumination subscale, .59 for the Magnification subscale, and .77 for the Helplessness subscale.

Short-Form McGill Pain Questionnaire (SF-MPQ; Melzack, 1984). This 15-item measure uses terms to define types of pain experiences. Individuals rated the terms on a 4-point scale according to the severity of the particular feeling at the current moment in time. The items on this measure represent two different dimensions of pain: sensory and affective. Higher scores are indicative of more pain whether assessing the dimensions of pain separately or as a combined measure of overall pain. The SF-MPQ is a shortened version of the McGill Pain Questionnaire; however it holds equally high reliability and validity to the longer version and incorporates the ease of administration needed in this study (Keogh et al., 2010; Lang et al., 2006; Melzack, 1984; Scott at al., 1983). Chronbach's alphas range from .65 to .88 for this scale (Melzack, 1984). In the current sample, Chronbach's alpha was.91 and the average corrected item total correlation was .66.

Procedure

Upon check in for their appointment, patients were asked by clinic staff if they were interested in participating in a study regarding factors that cause post-abortion pain. If the patient expressed interest, they were given the Research Information Sheet, along with the informed consent form. The PI was available at all times to answer any questions or concerns regarding

study details or the consent process. Once consenting patient's returned their signed forms, they were put into a file labeled "consent forms" kept in a locked cabinet at the clinic. Participants were then asked by a clinic employee to complete a set of questionnaires which measured various psychological factors. Participants were given a numbered packet containing all the pre-surgical psychological measures (PSEQ-Modified, STAI, ECR-S, and the PCS). A study member recorded the participant's name and number of the packet given on a master list which was shredded immediately after the last round (time 3) of data collection and entry of information into a data sheet which only contained participant's number. The master list was housed in a locked file separate from other participant data within the clinic. The packet number was the participant's study number for the remainder of the study and was the only thing used when recording data for analysis. The participant's name was not associated with the study number when data was recorded and analyzed**.** Participants completed the packet of questionnaires in the clinic's waiting room during extended wait times already built in to the pre-abortion service clinic protocol. Participants were asked to turn the packet back into the staff member in the ***sealed envelope*** once completed. The PI was available at all times to answer any questions regarding the study or to clarify questionnaire instructions for participants. Once questionnaires were returned inside the *sealed envelope*, they were placed in a file labeled "preoperative completed" in a locked cabinet separate from the participant's medical files. Packets were not opened until participant's number had been disassociated with their name and results were ready to be recorded. All envelopes remained sealed and were not opened until final data collection was completed by the PI.

Pain was rated three times following the procedure. Subjective pain was rated on a 10 point Likert scale ranging from 0 (no pain) to 10 (the most pain ever experienced). Time 1 pain

ratings were made in the recovery room directly following the procedure. Time 2 ratings were made during a "well check" phone call the morning after their procedure. Time 3 ratings were made at a two week follow up appointment in the office. In addition to assessing pain using the 0-10 scale at Time 3, participants were asked to complete the Short-Form McGill Pain Questionnaire (SF-MPQ) and the Pain Self-efficacy Questionnaire-Standard (PSEQ-Standard). Demographic information, including age, ethnicity, marital status, and occupation, was obtained from the patient's existing medical chart. The patient's choice of sedation for the procedure, as well as after care pain medication prescribed, were also recorded. The master list containing the participant's name and number was then destroyed using a paper shredder, so the participant's name was no longer linked to the number. Following completion of the study, all consent forms and hard data files were moved to a locked file cabinet in a locked office (i.e. Dr. Caleb Siefert's Lab) on the University of Michigan – Dearborn Campus. All data is housed in this location for the duration required by the American Psychological Association. All data was entered into SPSS at this location. Participant numbers were used for all data entry. All data analyses were also carried out at this location.

Results

Sample size, psychometric properties, averages, and standard deviations for each measure and for subjective pain ratings are reported in Table 2. Zero-order correlations among each scale, age, and pain ratings are reported in Table 3. Correlations between predictor variables and pain variables are reported in Table 4. Significant correlations between several of the predictor variables and Time 3 and SF-MPQ pain scores were found. Age, marital status (married vs. not married) and employment status (employed/student vs. non-employed) were looked at in regards to subjective pain ratings and the SF-MPQ. Age was not correlated to pain

ratings at any time point. Subjective pain ratings and SF-MPQ scores did not significantly differ at any time point as a function of employment or marital status.

Prior to conducting hypothesis tests, we examined the intercorrelations among the pre-surgical predictors (i.e., self-report measures). XXX

Subjective Pain Ratings

Prior to focusing on examining data pertaining to my hypotheses, I examined subjective pain scores and changes over time. Since participant attrition resulted in missing data, I elected to use paired *t*-tests (as opposed to repeated measures ANOVA) in an effort to maximize the power of each analysis. As can be seen in Figure 1, there was a decline from Time 1 to Time 2 in subjective pain reports, but this difference did not achieve statistical significance (t (25) = 0.85, p = .40). There was a significant decline for subjective pain ratings from Time 2 to Time 3 (t (15) = 4.03, p < .01).

Hypothesis 1, 2 and 3.

To examine hypothesis 1, which predicted that higher state anxiety ratings prior to the abortion would be associated with higher time 1 pain ratings, I first examined the zero-order correlations. State anxiety ratings were not correlated with pain ratings at time 1 (r = .10, p = .44), meaning the first hypothesis was not supported. I also failed to find support for the second hypothesis, which predicted that higher trait anxiety ratings prior to the abortion would be associated with higher self-reported pain at Time 2 and 3, as trait anxiety ratings were not significantly correlated with pain ratings at Time 2 (r = .05, p = .79) or Time 3 (r = .21, p = .26). However, when looking at SF-MPQ at Time 3, both trait anxiety (r = .48, p = .01) and state anxiety (r = .47, p = .01) were significantly correlated with higher pain ratings.

There was some mixed support for hypothesis 3, which predicted higher levels of attachment anxiety would be associated with higher pain ratings at all follow up time intervals. Attachment anxiety, as measured by the ECRS Attachment Anxiety scale, was not correlated with subjective pain ratings at Time 1 (r = -.11, p = .41) or Time 2 (r =. 24, p = .17). However, higher attachment anxiety was significantly related to higher pain ratings at time 3 (r = .44, p = .01). Additionally, SF-MPQ scores at time 3 were also correlated with attachment anxiety (r = .47, p = .01). However, as discussed in detail in the exploratory analysis section below, Time 3 data, for both Likert scale ratings and the SF-MPQ was not normally distributed.

Hypothesis 4 and 5.

To examine hypothesis 4, which predicted that state anxiety ratings would mediate the relationship between attachment anxiety and negative pain outcomes at Time 1, a series of regressions were planned. This specific analysis is done as a three step process. The first step involves regressing the mediator (state anxiety) on the independent variable (attachment anxiety); the second is regressing the dependent variable (Time 1 subjective pain ratings) on the independent variable (attachment anxiety); and the third is regressing the dependent variable (Time 1 subjective pain ratings) on both the independent variable (attachment anxiety) and on the mediator (state anxiety). In order to show mediation, the independent variable must effect the mediator in the first equation, the independent variable must significantly effect the dependent variable in the second equation; and in the third equation, the mediator must effect the dependent variable. Once all the effects have held true, then the R^2 statistic needs to shift significantly in the third equation. Sobel tests are then employed to determine if the magnitude of this shift suggests mediation or partial mediation. If mediation effects are detected, then a mediation ratio is calculated (Barron & Kenny, 1986). For the first equation, attachment anxiety significantly

effected state anxiety (F (1, 87) = 10.12, p = .001), however in the second equation subjective pain ratings at Time 1 did not effect attachment anxiety (F (1, 60) = .700, p = .41) nor did state anxiety affect pain outcomes at Time 1 in the third equation (F (2, 59) = 1.07, p = .35). Therefore, no evidence was found for mediation and hypothesis 4 was not supported.

To examine hypothesis 5, which predicted that trait anxiety will mediate the relationship between attachment anxiety and negative pain outcomes at Time 2 and Time 3, a series of regression analyses were run for both times using the method described above. For Time 2 pain outcomes, the three regression equations were analyzed and results are as follows. In the first equation, attachment anxiety significantly affected trait anxiety (R=.37, R^2=.13, F (1, 84) = 5.27, p = .03, B=.36, $S.E.$ =.10, t=3.59, p=.001). However, in the second equation, attachment anxiety did not affect Time 2 subjective pain ratings. Also, trait anxiety did not significantly affect subjective pain ratings at Time 2 in the third equations. Therefore, trait anxiety did not mediate the relationship between attachment anxiety and negative pain outcomes at Time 2.

For time 3 pain outcomes, the three regression equations were also ran and the results are as follows. In the first equation, attachment anxiety significantly affected trait anxiety (R=.37, R^2=.13, F (1, 84) = 5.27, p= .03, B=.36, $S.E.$ =.10, t=3.59, p=.001). In the second equation, attachment anxiety significantly affected subjective pain ratings at time 3 (R=.47, R2=.22, F (1, 29) = 7.81, p<.01, B=.45, S.E. =.16, t=2.79, p<.01). Finally, in the third equation, trait anxiety did not significantly affect subjective pain ratings at Time 3. Since trait anxiety failed to predict pain at Time 3, the minimum requirements for mediation were not met.

We also examined pain at Time 3 using the SF-MPQ. As before, the three regression equations were ran and the results are as follows. In the first equation, attachment anxiety significantly affected trait anxiety (R=.37, R^2=.13, F (1, 84) = 5.27, p= .03, B=.36, $S.E.$ =.10,

t=3.59, *p*=.001). In the second equation, attachment anxiety significantly affected SF-MPQ ratings (R=.50, R2=.25, *F* (1, 29) = 9.54, *p*<.01, B=.48, S.E. =.16, t=3.09, p<.01). In the third equation, trait anxiety significantly affected SF-MPQ ratings (R=.48, R2=.23, *F* (1, 29) = 8.23, *p*<.01, B=.47, S.E. =.17, t=2.87, p<.01). When a regression was conducted using both the mediator (i.e. trait anxiety) and the independent variable (i.e. attachment anxiety) to predict SF-MPQ ratings the amount of variance predicted by the independent variable decreased slightly from B=.48 to B=.36. Since all three equations met the minimum standards for mediation, a Sobel test was conducted using unstandardized regression coefficients and standard errors. The Sobel test showed a trend towards statistical significance (z=1.71, p=.09). Overall, this analysis suggests that only a small portion of the relationship between attachment anxiety and SF-MPQ was explained by trait anxiety. In fact, attachment anxiety scores when entered on block 2, after trait anxiety scores, made a statistically significant incremental increase in predicted variance in SF-MPQ ratings (R^2 change= .12, *F* change (1)27=4.844, p=.04). The final model including both trait anxiety and attachment anxiety was significant (F (2, 29) =7.10, p<.03) and predicted 35% of the variance.

Exploratory

Two sets of **e**xploratory analyses were conducted. Some significant correlations emerged between predictors and pain ratings at Time 3. These finding regarding Time 3 must be interpreted with caution. As can be seen in Figures 2 and 3 the range of scores on the 10 point self-reported pain scale and the SF-MPQ was heavily restricted and positively skewed. Only 21.9% of the Time 3 sample reported pain ratings greater than 0, resulting in a heavily skewed distribution. The SF-MPQ may be slightly more sensitive as only 47% reported no pain on the SF-MPQ. Thus, the first set of exploratory analyses examined relationships between predictors

and Time 3 ratings to determine if findings were likely artifacts, rather than actual findings. Non-parametric tests were employed as these statistics do not assume normal variation of data. Correlations reported above between predictor variables and pain at time 3 that reached statistical significance were subjected to Spearman-Rho tests. Relationships between pain at time 3 and attachment anxiety (ρ = .36, $p < .05$) and PCS Helplessness (ρ =.36, $p < .05$) remained significant, but the relationship with state anxiety fell to a non-significant level. Relationships between the predictor variables that showed statistically significant correlations with the SF-MPQ using Spearman-Rho tests were also examined. Spearman-Rho tests revealed statistically significant correlations between the SF-MPQ and attachment anxiety (ρ = .62, $p < .001$), state anxiety (ρ =.41, $p < .02$), trait anxiety (ρ =.54, $p < .01$), and PCS Total (ρ =.42, $p < .02$). The scatterplot for the correlation between attachment anxiety and Time 3 ratings is shown in Figure 4 and the relationship between attachment anxiety and SF-MPQ ratings is shown in Figure 5.

Only a small number of participants had subjective ratings of pain that were greater than zero (n = 7). Using Mann-Whitney U tests, I compared those reporting some pain (i.e., those with subjective pain ratings of >0) with those reporting no pain at Time 3 (n = 25). Differences for attachment anxiety approached statistical significance (Wilcoxon W = 372.50; U = 47.50, z = 1.73, p = .09) between those reporting pain (M = 23.14, SD = 8.70) and those not reporting pain (M = 16.92, SD = 7.70). (see Table 5)

A similar approach was taken using the SF-MPQ. Those who had a score of 1 or less on this measure were placed in one group (n=18) and those reporting a score of 2 or higher in another group (n=12). Independent t-tests revealed significant differences for state anxiety (t (30) =3.23, p<.01), trait anxiety (t (28) =3.51, p<.01), and attachment anxiety (t (30) =2.88, p<.01). As seen in Table 6, in all cases the pain group was higher than the no pain group.

Pre-surgical correlations.

The next set of exploratory analyses involved examining relationships among variables in this study. It is important to note, however, when considering these findings that these results were not predicted with an aprior hypothesis. As such, these results are reported and discussed for the benefit of future investigators who may pursue research in this domain.

MPSE. The Modified version of the PSE was negatively correlated with both the State (r = -.34, p = .001) and Trait (r = -.22, p = .04) subscales of the STAI. The MPSE was negatively correlated with the total PCS score (r = -.35, p = .001), as well as the Following PCS subscales: Helplessness (r = -.37, p < .001), Magnification (r = -.30, p = .004) and Rumination (r = -.28, p = .01).

STAI. The STAI scale is separated into the state and trait subscales. The State subscale was significantly correlated with the Trait subscale (r = .73, p = .001) of the STAI. The State subscale was also correlated with the total PCS score (r = .43, p <.001) as well as all three of its subscales; Helplessness (r = .45, p < .001), Magnification (r = .31, p = .003) and Rumination (r = .38, p < .001). The State subscale was also significantly correlated to both the ECR-S Attachment Anxiety scale (r = .34, p = .001) and Avoidance scale (r = .34, p = .001).

The Trait subscale was significantly related to PCS total score (r =.46, p < .001) and the Helplessness (r = .48, p <.001), Magnification (r = .42, p <.001) and Rumination (r = .36, p = .001) subscales. The Trait subscale was positively correlated with both ECRS Attachment Anxiety scale (r = .37, p < .001) and Attachment Avoidance subscale (r = .37, p < .001)

PCS. The PCS Helplessness scale is correlated with both of the other PCS subscales; Magnification (r =.76, p < .001) and Rumination (r = .79, p < .001). The Magnification and Rumination subscales are also related to one another (r = .73, p < .001).

ECRS. The ECRS Anxious subscale was correlated to all the PCS subscales; Helplessness ($r = .39$, $p < .001$), Magnification ($r = .30$, $p = .01$) and Rumination ($r = .42$, $p < .001$).

Post-surgical Correlations.

Pain Ratings. Pain at Time 1 was significantly correlated to ratings at time 2 ($r = .44$, $p = .02$), which is to be expected as time 2 pain ratings were gathered the day following the abortion procedure. No other significant correlations were found for pain ratings at time 1. Time 2 pain ratings were significantly correlated to Likert pain ratings taken at time 3 ($r = .63$, $p = .01$), which were gathered at a follow up appointment in the office approximately two weeks following the participant's abortion procedure. No other significant correlations were found between time 2 data and other predictor or outcome measures. As would be expected, Likert time 3 pain ratings were highly correlated to scores on the SF-MPQ ($r = .55$, $p = .001$), which was given to client at the same time. However, results should be interpreted with caution because time 3 Likert ratings and SF-MPQ scores were not normally distributed.

SF-MPQ. Surprisingly and contrary to expected outcomes, high pain self-efficacy measured by the PSE questionnaire was correlated with higher pain ratings on the SF-MPQ ($r = .44$, $p = .01$). As to be expected, both state ($r = .47$, $p = .01$) and trait ($r = .48$, $p = .01$) anxiety were related to higher SF-MPQ scores. High scores on the SF-MPQ were also significantly correlated to the Helplessness ($r = .51$, $p = .003$), Rumination ($r = .37$, $p = .04$) subscales and the overall score ($r = .44$, $p = .01$) of the PCS.

PSE. As to be expected, the PSE was significantly correlated to the MPSE ($r = .73$, $p < .001$) The PSE was negatively correlated to all other predictor and pain variables, however, none reached statistical significance.

Discussion

Various measures of anxiety, pain catastrophizing, self-efficacy and attachment style have been widely investigated and linked to the pain experience (Keogh et al., 2010; Lang et al., 2006; Meredith et al., 2006; Papaioannou et al., 2009; Scott et al., 1983; Sommer at al., 2010; Tremblay & Sullivan, 2010). However, few have considered pain following a voluntary abortion surgery. In the few studies that have investigated this link, pre-surgical factors such as fear of the procedure and it's after affects (Singh et al., 2008), anxiety and depression, moral and social concerns regarding the abortion, and age and education (Belanger at al., 1989; Pud & Amit, 2008) were found to predict pain outcomes. The current study sought to extend prior findings related to abortion care by further investigating if pre-abortion psychological correlates of pain were associated with the post-abortion pain experiences.

Based on prior research (e.g., Pud & Amit, 2005), it was predicted that higher state anxiety ratings pre-abortion would predict higher pain ratings immediately following the procedure (Time 1) and that trait anxiety ratings would predict higher pain at Time 2 and Time 3. Some modest support was obtained for this hypothesis depending on which pain measurement method was considered. State anxiety did not predict subjective pain ratings at Time 1 and trait anxiety did not predict subjective pain ratings at Time 2 or Time 3. However, higher SF-MPQ scores did correlate with both state and trait anxiety at Time 3. Non-parametric tests, which were used to account for the fact that SF-MPQ scores were not normally distributed, supported these findings as well.

These results can be considered in several ways. On the one hand they do fit the theoretical model suggesting that anxiety is related to pain outcomes. However, counter to expectations, both state and trait scores were correlated to SF-MPQ scores which were collected

weeks following the procedure. Given that these scores were obtained two weeks post-procedure, one would have expected only trait anxiety scores to have been related. Further, though related and in the predicted direction, the overall range of pain scores was quite low. Thus, though state and trait anxiety were modestly predictive of patients at risk for high pain levels, the range of pain levels was quite restricted. In fact, simple subjective pain ratings (i.e., pain rated on a 0 to 10 scale) proved to be insensitive in terms of capturing these relationships. Only the SF-MPQ appeared to be sensitive enough. Again, this suggests that pain levels (even among those reporting some pain) were likely quite low. Thus, though the present data do support some aspects of the gate-control theory of pain and anxiety, the overall level of pain observed (or in this case the lack of pain observed) may not be problematic in a day-to-day sense. As such, the real-world benefits may be somewhat questionable, though further research would be needed to fully substantiate this claim and one should consider differences between this study and previous studies before jumping to conclusions.

Adult attachment, and especially attachment anxiety, has also been shown to impact areas of pain coping, such as pain-related fear, hypervigilance, catastrophizing and level of pain (Andrews et al., 2011; Davies, Macfarlane, McBeth, Morriss, Dickens, 2009; Kratz, Davis, & Zautra, 2011; McWilliams & Asmundson, 2007; Porter et al., 2007). These associations have been found to be relevant in both acute pain (Tremblay & Sullivan, 2010) and chronic pain conditions (Kratz et al., 2011). Therefore, it was hypothesized that attachment anxiety would be correlated with higher pain ratings at each time point. At Time 1 and Time 2, attachment anxiety was not correlated with higher pain ratings. At the Time 3 interval, attachment anxiety was significantly correlated with higher subject pain ratings and MPQ-SF ratings.

This is somewhat consistent with past research which links insecure attachment styles to more severe pain (e.g., Kratz et al., 2011). These results need to be interpreted with caution since Time 3 subjective pain data was not normally distributed, with a high percentage of women indicating little or no pain at all. Because of the non-normality, additional non-parametric analyses were conducted and we examined differences between women with at least some subjective pain and women who reported no subjective pain on the 0 – 10 scale. Results approached significance, where women with attachment anxiety were more likely to report some level of pain at Time 3. In contrast, when similar analyses were conducted with the SF-MPQ results achieved statistical significance. Further, when separating into pain and no pain groups, women who reported some pain on the SF-MPQ also scored higher for attachment anxiety.

Individuals with attachment anxiety tend to fear abandonment and feel apprehension about the availability of others to provide emotional support. These individuals also tend to focus on more negative emotional experiences which impacts the way they think, feel and behave in relationships with others. Mikulincer and Shaver (2007) view this tendency to be highly focused on distress as part of a larger set of strategies designed to keep the attachment system activated. This is referred to as "hyperactivation." Indeed, individuals high in attachment anxiety are expected to focus more on painful experiences, causing them to report more pain (Lo et al., 2009). Much of the pain research has lent support for this hypothesis, where individuals with more attachment anxiety reported more pain across different acute and chronic pain experiences (Andrews et al., 2011, Meredith et al., 2006). Taking previous research into consideration, it seemed plausible that the same interaction would take place following abortion procedures. The current study did provide some further support for prior research. Women who continued to

experience some pain weeks after their procedure tended to have higher scores for attachment anxiety as compared to women who were experiencing no pain.

It was also expected, however, that attachment anxiety would be related to pain ratings at Time 1 and 2. It is unclear why these relationships did not emerge. It's possible that the dynamics of a romantic relationship can change over the course of a stressful event, such as an abortion procedure, which may have impacted women's ECRS responses. In other words, though the ECRS attempts to tap chronic personality features, respondents may have responded to the specific ECRS questions based on their immediate circumstances and relationship. Therefore, correlation to pain may have been affected if women showed responses similar to those with anxious attachment prior to the procedure, but these responses were purely circumstantial and not representative of their relationship as a whole. In future research, it may be beneficial to have participants fill out a measure of romantic attachment, such as the ECRS, at every pain rating time interval. This would control for circumstantial changes in the dynamics of the romantic relationship over time and throughout a stressful event, such as an abortion procedure.

Anxiety has been shown in prior research to mediate the relationship between attachment styles and pain severity. A previous study measured the mediating role of pain catastrophizing and anxiety on the attachment and pain relationship in high school students. It was shown that the correlation between fearful attachment and pain severity was significantly mediated by anxiety. This is consistent with a theory of pain that links attachment to physical, emotional and cognitive aspects of pain, including self-appraisals of pain, evaluations of self-perceptions and others reactions to pain (Tremblay & Sullivan, 2010). With this research in mind, it was hypothesized that the current study would show that the relationship between attachment anxiety

and pain severity would be mediated by anxiety. Furthermore, using Speilberger's definition of state/trait anxiety, it was hypothesized that the mediating effect would appear at different time intervals depending on the type of anxiety being analyzed. It was predicted that state anxiety would be shown to mediate the relationship and Time 1 and trait anxiety would mediate the relationship at Time 2 and Time 3.

Results of the current study showed that the relationship between attachment anxiety and subjective pain ratings at time 1 was not mediated by state anxiety. In order for mediation effects to hold true in the analysis, both attachment anxiety and state anxiety would have to affect Time 1 subjective pain ratings. As shown in this study's previous hypotheses, neither of these assumptions held true, therefore the mediation effect of state anxiety on the attachment and pain relationship is impossible in this study. Additionally, results showed that trait anxiety did not mediate the relationship between attachment anxiety and subjective pain ratings at Time 2 or Time 3. Again, neither attachment anxiety nor trait anxiety were related to Time 2 or Time 3 pain; therefore, mediation was not present within this sample. Future research may want to expand on the current findings by looking at how other attachment styles (secure and insecure) may influence pain severity and if trait anxiety plays a role in mediating any relationships that may emerge.

We did, however, find some evidence of mediation when looking at SF-MPQ and attachment anxiety. Looking at the overall analysis of these factors, there was a trend towards significance and a small portion of the relationship between pain scores and attachment anxiety was explained by trait anxiety. This partial mediation effect, however, was small and only approached significance. Regression analysis tended to suggest that both variables made unique contributions to predicting SF-MPQ ratings. Taken together, it seems that trait anxiety and

attachment anxiety provide a unique pathway to pain. One of the defining characteristics of both of these variables is difficulty in regulating negative emotions. This mutual characteristic may contribute to why an individual would be at most risk for pain when holding an anxious disposition both intrapersonally and interpersonally. Still, attachment anxiety refers to a much more specific construct (i.e., worry over relationships; tendency to cope with stress by seeking out others; tendency to form dependent relationships; negative model for self). Though attachment anxiety is related to trait anxiety, they are conceptually different. The present findings suggest that even if they overlap in some ways, their role in pain processes may be different.

Several exploratory analyses where run with this sample's data using Pearson's Correlation and some interesting results emerged. Of particular interest to the current study was the correlation between anxiety and pain catastrophizing. Both state and trait anxiety were positively correlated with overall pain catastrophizing. This is consistent with findings in past research looking at the relationship between anxiety and pain catastrophizing in patients undergoing lumbar fusion surgery (Papaioannous at al., 2009). Although pain catastrophizing did not correlate to any of the Likert scale pain ratings, it did significantly correlate with the SF-MPQ ratings at time 3. This is consistent with previous studies which examined the relationship between pain catastrophizing and pain level in a sample exposed to experimental pain (Weissman-Fogel et al., 2008) and in post-operative pain (Papaioannou et al, 2009; Pavlin at al, 2005). There has been some research suggesting that pain catastrophizing mediates the effects of anxiety on postoperative pain (Granot & Ferber, 2005). Future research may want to examine pain catastrophizing's mediating effect of both state and trait anxiety on post-abortion pain.

In the current study, pain catastrophizing was also significantly related to attachment anxiety. This is supportive of a previous study which found that individuals with chronic pain and more attachment insecurity tended to make more negative appraisals about pain and tended to imagine and conceptualize pain in more catastrophic terms (McWilliams & Asmundson, 2007). Additionally, these results are consistent with a previous study which looked at women with chronic pain and how anxious attachment related to catastrophizing on days where they experienced high levels of pain. Much like the current study, results showed that anxious attachment was related to greater increases in catastrophizing (Kratz et al., 2011). These findings are supportive of Attachment Theory, which states that individuals with higher levels of attachment anxiety have negative models for self and view themselves as incapable of coping on their own (Barthlomew & Horowitz, 1991). They tend to fear they will not be able to meet or handle future challenges, and may imagine catastrophic events, which leads them to chronically seek and maintain close proximity with partners on both physical and emotional levels. In pain populations, this negative self-concept translates into the inability to cope with pain effectively (Kratz et al., 2011). Future research may want to expand upon the current study and existing literature to include more acute pain populations when looking at the relationship between attachment and catastrophizing.

Primarily investigated in the chronic pain literature, pain self-efficacy has also been shown to impact pain level and intensity. Higher self-efficacy has been associated with greater pain tolerance in experimental pain studies (Dolce et al., 1986). In chronic pain samples, pain self-efficacy is shown to be negatively correlated with pain severity, (Hadjistavropoulos, Dash, Hadjistavropoulos, & Sullivan, 2007) and anxiety and positively correlated to insecure attachment (Meredith et al., 2006). In the current study, pain self-efficacy was negatively

correlated to both state and trait anxiety and pain catastrophizing using the modified version of the PSE given prior to the procedure. This is consistent with the literature which presumes that individuals who are more confident in dealing with their pain tend to have less anxiety over all and do not over exaggerate their pain experiences. The PSE is a measure used more in chronic pain experiences rather than more short term pain, such as post-abortion pain. Future research may want to investigate and utilize a measure which touches on the acute conditions of pain.

Limitations

There are a number of potential reasons for the current study's failure to replicate past research results. For example, Pud and Amit (2005) took pain measurements at time intervals set closer to the time of the procedure (i.e. 15 minutes, 30 minutes and 60 minutes). Pud and Amit (2005) found that the relationship between anxiety and pain dropped to non-significant levels after 1 hour post-surgery. Thus, it is possible, that our pain assessments taken after 24 hours and 2 weeks following the surgery were too delayed. Further, this failure to find may be due to a confounding factor within the current study. Approximately 91% of participants received some sedation during the procedure. Since Time 1 pain ratings were taken immediately following the procedure, the continued effects of the sedation may have caused lower reported pain. In future research, it may be beneficial to allow more time between administrations of sedation and self-report post-operative pain ratings to avoid the pain relieving effects medications. Another possible explanation for this lack of correlation is lack of data. A low number of participants had data for both the Time 2 and Time 3 follow up periods. At Time 2 (n=36) only 40% of the total sample from Time 1 had data. At Time 3 (n=32) only 35.6% of the total sample remained. It is impossible to know for certain the effect attrition had on the findings. Several factors may have contributed this lack of data. First, clinic staff may have not been following study protocol

adequately, since there were such a high number of participants who had no pain rating at time 1. Clinic staff may have forgotten to consistently ask for pain ratings while participants were in the recovery area, since this formal method of gauging pain after the procedure was new to the clinic protocol. Second, follow up rates for abortion care in general tend to be limited. Because of the nature of the service and emotional component of the surgery, many women do not come to follow up appointments. This leaves very little opportunity to gain time 3 follow up data, as it was obtained at participant's follow up appointments. Future researchers may want to better train study staff and provide incentives to follow study protocol adequately. Additionally, future studies coule use mail or email to send follow-up questionnaires to participants to decrease attrition rates at follow up time intervals.

Another limitation of the study is that participants tended to report very low levels of pain or no pain at all. At Time 1, this may have been due to the sedation participants received during their procedure. As pain ratings were taking immediately after the abortion, the effect of sedation may have still been masking any pain, causing lower pain ratings at Time 1. At Time 2 and 3, participants also tended to report little or no pain. It's possible that too much time passed between the procedure and these pain rating times to have any lasting pain from the procedure. Future research should take into consideration the effects of sedation and wait until just before the participant is discharged from recovery to get a pain rating. Additionally, Time 2 and 3 follow up pain ratings may want to be gathered sooner.

Future Directions

Due to several limitations of the current study, researchers who wish to expand on this research should consider making some alterations to the protocol. Firstly, as is true with many pilot studies, future research in this arena should attempt to gather a bigger sample size. This will

ensure a more chance of follow up and better statistical power. Additionally, to aid in better follow up, researchers may want to consider contacting individuals who were not reachable by phone for Time 2 data or did not return to the clinic for Time 3 data by mailing them follow up questionnaires. This may help with the large attrition rate present in this study.

The time intervals in which pain data was collected may have contributed to the low number of women reporting pain. Women were asked immediately after their surgery to rate their pain level. As most women received intravenous sedation during the procedure, it is possible that effects of the sedation were masking pain, causing ratings to be lower than expected. Future research may want to consider waiting longer after the procedure to take first pain ratings. Alternatively, Time 2 and Time 3 pain ratings were unexpectedly low, with most women reporting little to no pain. It may be helpful to gather later pain ratings before the 24 hour post-abortion time period to avoid complete diminishment of pain. Researchers should also consider using pain rating measures that are sensitive to very low levels of pain. In the present study, the SF-MPQ appeared to be more sensitive than simple 0-10 point subjective pain ratings.

Finally, some of the lack of data was due to clinic staff error or forgetfulness. It may be beneficial for future researchers to provide more adequate training for clinic staff to ensure effective data collection. Also, providing incentive such as monetary compensation, if available, may help to motivate clinic staff to be more invested to effective data collection. Unfortunately, the current study did not allow availability of such compensation.

Conclusions

Overall, the data does show some support that certain psychological variables are connected to post-surgical pain levels; however, many results only show statistical trends nearing significance. Nonetheless, this study can be used to inform future research focusing on the

relationships between psychological factors and post-abortion pain. Further, the present results do suggest that it may be worthwhile for future investigators to continue to examine the roles of trait anxiety and attachment. Attachment status is linked to how individuals manage their emotions and is also related to the experience of anxiety. Present results suggest that continued exploration of how attachment relates to pain is warranted in general, and may be useful for future researchers studying pain post-abortion. Future studies may provide important information allowing clinicians to develop pre-abortion methods of identification and intervention for women who may be at a higher risk of poor pain outcomes following their surgery.

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Table 1

Demographic Variables of Sample

Variable	N	%	*M (SD)*
Total Participants			
Age	90	100	25.87 (6.06)
Marital Status			
Single	71	78.9	
Married	12	13.3	
Separated	4	4.4	
Divorced	1	1.1	
Engaged	1	1.1	
None recorded	1	1.1	
Employment Status			
Employed	64	71.1	
Unemployed	19	21.1	
Student	6	6.7	
None recorded	1	1.1	
Sedation			
Fentanyl (100mcg)	44	48.8	
Fentanyl (100mcg) + Versed (1.5mg)	38	42.2	
No Sedation	4	4.4	
None recorded	4	4.4	
Post-AB Meds			
Motrin 800	83	92.2	
Motrin 800 + Tylenol 3	3	3.3	
None recorded	4	4.4	
Pain Rating Data			
Time 1	64	70	
Time 2	35	40	
Time 3	32	35.6	

Table 2

Psychometric Properties of Scales

	n	Items	Min	Max	*M*	*SD*	Skew	Kurt	α	Average Corrected Item-Total Correlation
PSE										
Modified (pre-AB)	90	14	21	84	66.2	14.4	-.80	.33	.93	.66
Standard (post-AB)	90	10	.00	49	12.1	11.5	1.18	.99	.97	.86
STAI										
State	90	20	18	77	41.8	12.1	.65	.66	.93	.61
Trait	87	20	19	63	35.4	9.9	.60	-.23	.90	.53
PCS Total	90	13	.00	49	12.1	11.5	1.2	.99	.94	.73
Rumination	90	4	.00	16	5.2	4.4	.61	-.62	.88	.75
Magnification	90	3	.00	12	2.5	2.7	1.0	.64	.75	.59
Helplessness	90	6	.00	22	4.4	5.3	1.6	2.4	.92	.77
ECRS										
Anxiety	89	6	1	6	3.1	1.3	.43	-.50	.74	.50
Avoidance	89	6	1	5.5	2.4	1.0	.76	.25	.75	.50
SF-MPQ[a]	32	13	.00	20	3.1	5.4	2.3	4.6	.91	.66
Pain										
Time 1	63	1	.00	10	3.3	2.8	.75	-.35		
Time 2	36	1	.00	9	2.9	2.3	.56	-.21		
Time 3	32	1	.00	8	.69	1.8	3.2	10.3		

Note: Min=Minimum; Max=Maximum; *M*=Mean; *SD*=Standard Deviation; Skew=Skewness; Kurt=Kurtosis; α=Chronbach's Alpha

a=item 6 and 15 for this scale had zero variance and were removed (all participants rated zero for these items). PSE= Pain Self-efficacy Questionnaire; STAI=State Trait Anxiety Inventory; PCS= Pain Catastrophizing Scale; ECRS= Experience in Close Relationships Scale- Short Form; SF-MPQ= Short Form McGill Pain Questionnaire.

Table 3

Zero-Order Pearson Product Moment Correlations

	Age	MPSE	PSE	STAI-State	STAI-Trait	PCS Total	PCS-RUM	PCS-MAG	PCS-HELP	ECRS-ANX	ECRS-AVO	Pain 1	Pain 2	Pain 3
Age	-													
MPSE	-.02	-												
PSE	-.02	.73**	-											
STAI-State	-.06	-.34*	-.41	-										
STAI-Trait	-.06	-.22	-.29	.73**	-									
PCS-Total	-.03	-.35**	-.12	.43**	.46**	-								
PCS-RUM	-.11	-.28**	-.03	.38**	.36**	.92**	-							
PCS-MAG	.07	-.30**	-.01	.31**	.42*	.87**	.73*	-						
PCS-HELP	-.004	-.37**	-.22	.45**	.48*	.95*	.79*	.76**	-					
ECRS-ANX	-.24*	-.09	-.13	.34**	.37*	.41**	.42**	.30	.39*	-				
ECRS-AVO	.10	.05	-.06	.34**	.37*	.01	-.06	.07	.04	.19	-			
Pain 1	-.07	-.13	-.09	.10	.13	-.05	-.04	-.07	-.05	-.11	.09	-		
Pain 2	-.20	.12	-.28	.12	.05	-.08	.12	-.27	-.13	.24	.08	.44	-	
Pain 3	-.14	-.11	-.17	.50**	.21	.33	.33	.09	.36	.44*	.15	.01	.63*	-
SF-MPQ	-.24	-.10	-.23	.47*	.48	.44	.37*	.13	.52	.47*	.07	.09	.24	.55**

Note: $^{*}p < .05$; $^{**}p < .01$. PSE= Pain Self-efficacy Questionnaire; STAI=State Trait Anxiety Inventory; PCS= Pain Catastrophizing Scale (RUM=Rumination, MAG=Magnification, HELP=Helplessness); ECRS= Experience in Close Relationships- Short Form (ANX= Anxious, AVO= Avoidant); SF-MPQ= Short Form McGill Pain Questionnaire.

Table 4

Predictor Variable and Pain Rating Correlations

	Pain 1	Pain 2	Pain 3	SF-MPQ
PSE				
Modified (pre-AB)	-.13	.12	-.11	-.10
Standard (post-AB)	-.05	-.08	.33	.44*
STAI				
State	.10	.12	.50**	.47**
Trait	.13	.05	.21	.48**
PCS Total	-.05	-.08	.33	.44*
Rumination	-.04	.12	.33	.37*
Magnification	.07	-.27	.09	.13
Helplessness	-.05	-.13	.36*	.52**
ECRS				
Anxiety	-.11	.24	.44*	.47**
Avoidance	.09	.08	.15	.07
SF-MPQ	.09	.24	.55**	

Note: *=$p < .05$; **=$p < .01$. PSE= Pain Self-efficacy Questionnaire; STAI=State Trait Anxiety Inventory; PCS= Pain Catastrophizing Scale; ECRS= Experience in Close Relationships- Short Form; SF-MPQ= Short Form McGill Pain Questionnaire.

Table 5

Subjective Pain vs. No Pain

	Pain			No Pain			*t*	*p*
	n	*M*	*SD*	n	*M*	*SD*		
MPSE	7	65.3	11.0	25	67.2	13.7	.34	.74
PSE	7	50.7	7.3	24	52.3	11.47	.35	.73
STAI-State	7	45.1	20.4	25	40	10.6	-.91	.37
STAI-Trait	7	35.1	12.4	23	32.8	10.3	-.50	.62
PCS-Total	7	17.7	10.1	25	12	10.7	-1.3	.22
PCS-RUM	7	7.4	3.3	25	5.6	4.3	-1.0	.31
PCS-MAG	7	2.6	2.1	25	2.3	2.5	-.22	.86
PCS-HELP	7	7.7	5.6	25	4.0	5.0	-1.7	.11
ECRS-ANX	7	23.1	8.7	24	16.9	7.6	-1.8	.08
ECRS-AVO	7	13.1	3.9	24	13.7	6.0	.23	.82

Note: M= mean; *SD*= standard deviation; PSE= Pain Self-efficacy Questionnaire; STAI=State Trait Anxiety Inventory; PCS= Pain Catastrophizing Scale (RUM= Rumination, MAG= Magnification, HELP= Helplessness); ECRS= Experience in Close Relationships Scale- Short Form (ANX= Anxious, AVO=Avoidant)

Table 6

SF-MPQ Pain vs. No Pain

	Pain			No Pain			*t*	*p*
	n	M	SD	n	M	SD		
MPSE	12	66.1	12.1	20	67.5	14.0	.28	.78
PSE	12	51.0	6.4	20	53.0	12.3	.52	.61
STAI-State	12	50	14	20	37	8.8	-3.2	.003
STAI-Trait	12	40.8	10	18	29.4	7.8	-3.5	.002
PCS-Total	12	17.8	11.6	20	11.2	9.0	-1.8	.08
PCS-RUM	12	7.4	4.3	20	5.2	3.8	-1.5	.14
PCS-MAG	12	3.0	2.2	20	2.3	2.5	-.82	.42
PCS-HELP	12	7.4	6.6	20	3.7	3.8	-2.0	.05
ECRS-ANX	12	23.3	7.5	20	15.6	7.2	-2.9	.007
ECRS-AVO	12	15.0	6.4	20	13.5	5.8	-.67	.51

Note: M= mean; *SD*= standard deviation; PSE= Pain Self-efficacy Questionnaire; STAI=State Trait Anxiety Inventory; PCS= Pain Catastrophizing Scale (RUM= Rumination, MAG= Magnification, HELP= Helplessness); ECRS= Experience in Close Relationships Scale- Short Form (ANX= Anxious, AVO=Avoidant)

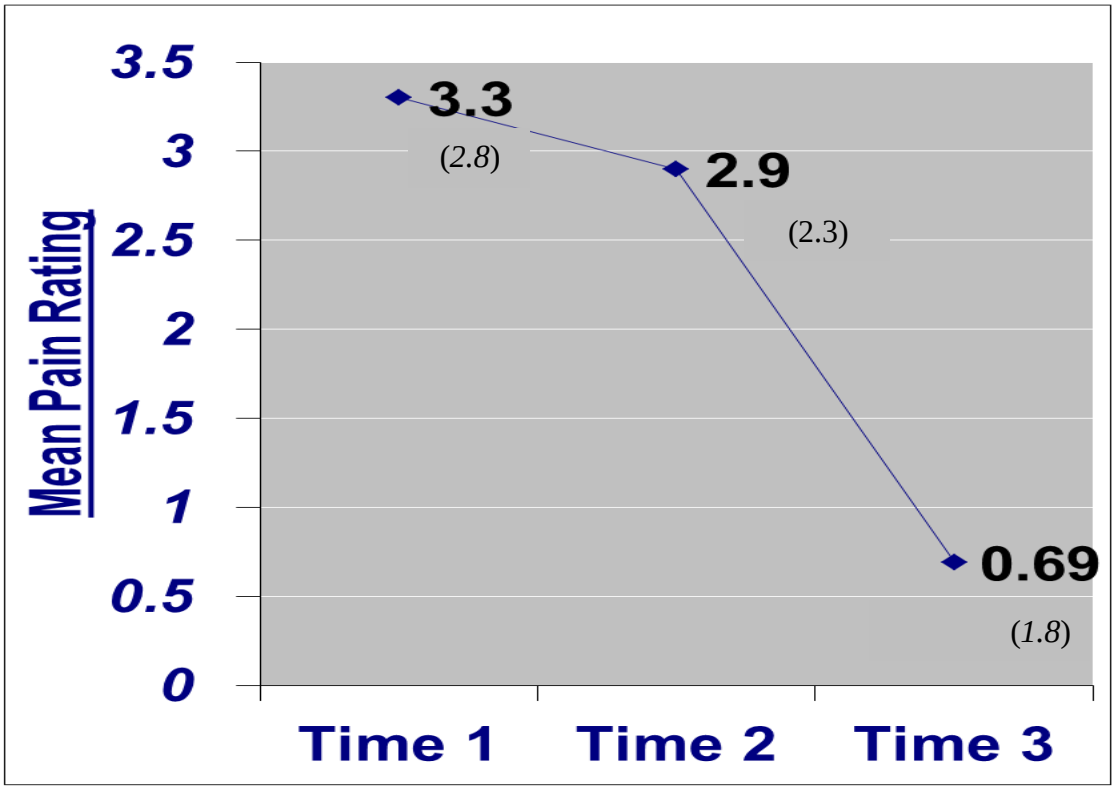

Figure 1. Mean Pain Ratings and standard deviations (in parentheses) at Time 1, 2 and 3. Time 1 to Time 2: t (25) = 0.85, p = .40. **Time 2 to Time 3: t (15) = 4.03, p < .01

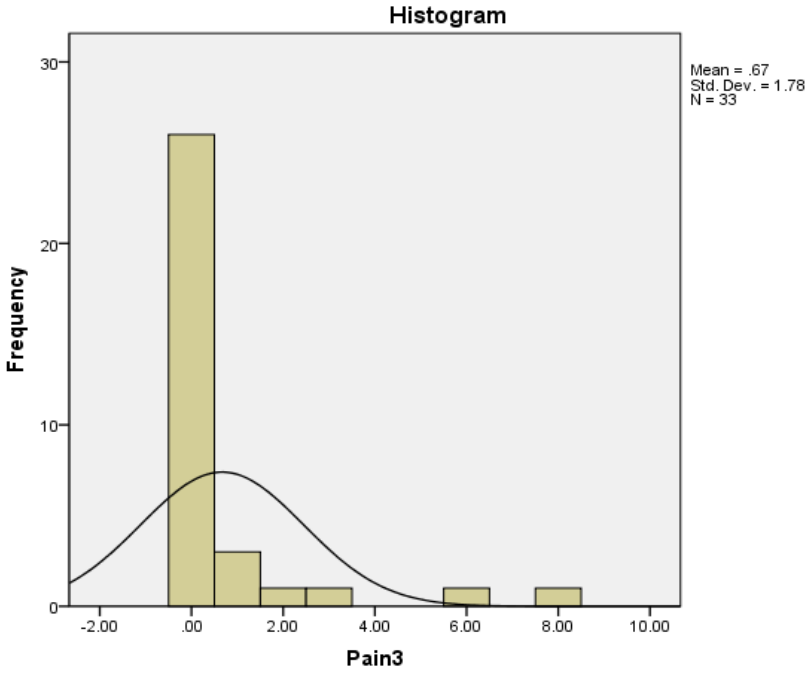

Figure 2. Histogram of Time 3 Pain Scores

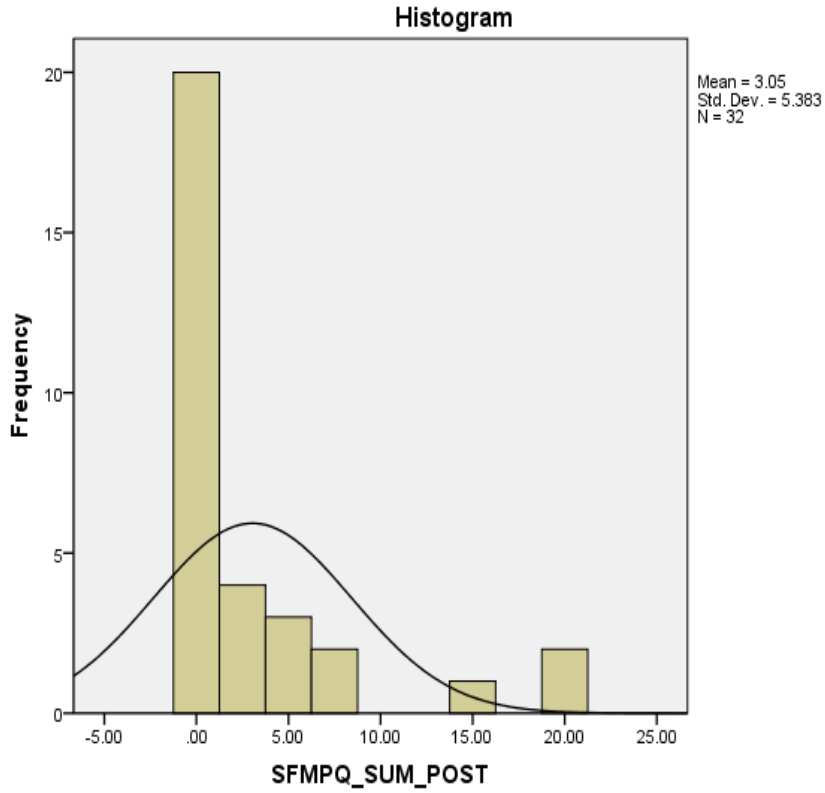

Figure 3. Histogram of SF-MPQ Scores

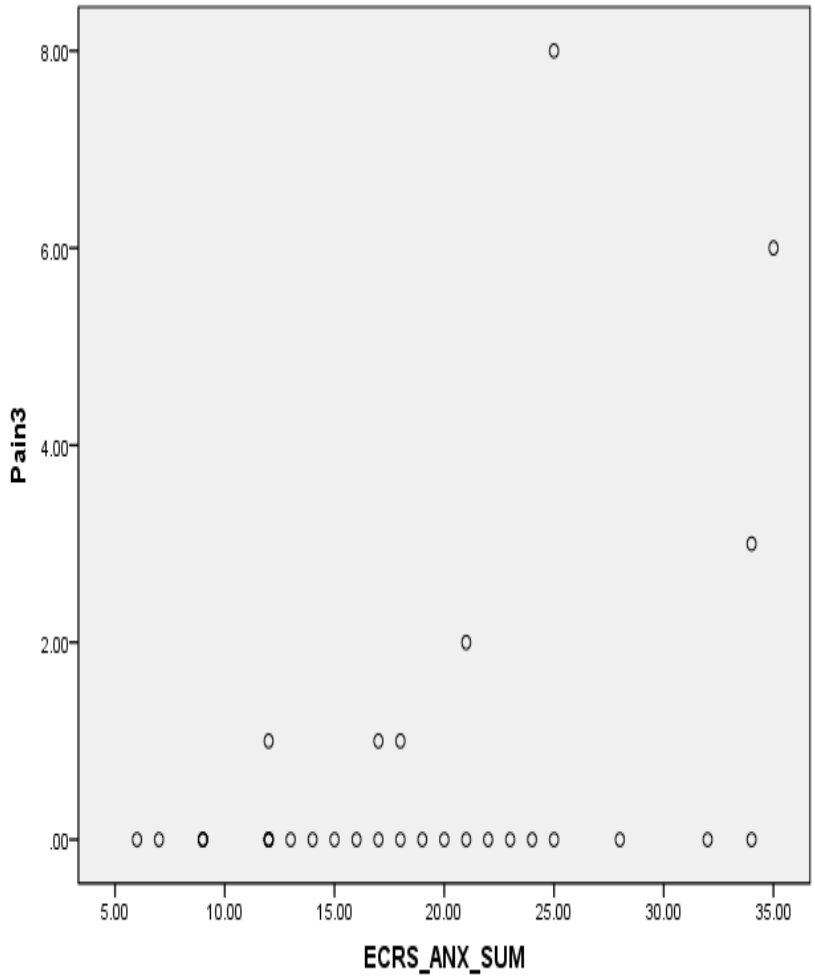

Figure 4. Scatterplot of Attachment Anxiety and Time 3 Pain Rating Correlations

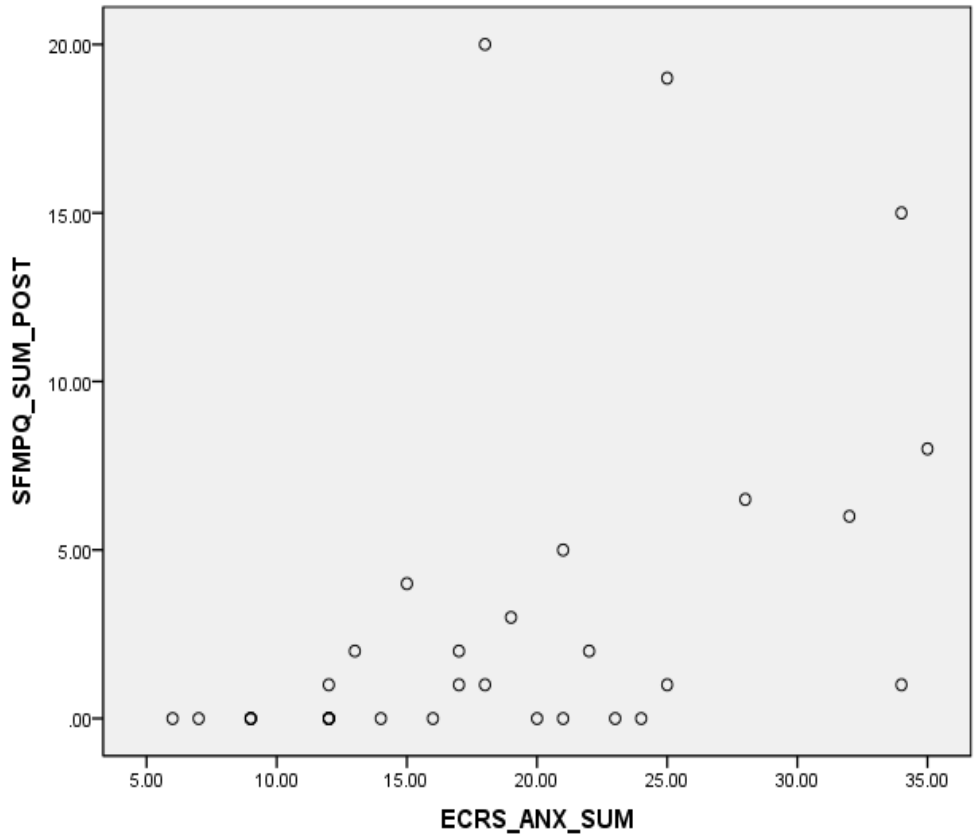

Figure 5. Scatterplot of Attachment Anxiety and SF-MPQ Score Correlations