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The Effects of Emotional Instability on Quality of Life in Chronic Pain Patients Undergoing Cognitive Behavioral Therapy for Chronic Pain

by

Justin Michael Hughes

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requirements for the Honors Diploma
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Dedication:

This Honors thesis is dedicated to a small group of people who have been instrumental in my success as an undergraduate student.

First, to my wife, Laura, and our sons, Aaron and Caleb, for their support and patience throughout the process of completing my undergraduate degree and preparing for graduate work.

Second, to Dr. Eric Seemann, for the many opportunities he gave me, and for his tireless efforts to instill within me the tools to reach my full potential.

Finally, to Dr. Aurora Torres, whose unwavering demand for nothing less than excellence has instilled in me the ability to write this thesis.

Abstract

Chronic pain is a condition of persistent moderate to severe pain which lasts more than six months and affects an estimated 100 million Americans. Although medical treatments for pain exist, chronic pain is often refractory to traditional pain management techniques, most of which involve unwanted side effects. Cognitive Behavioral Therapy (CBT) for chronic pain is a psychological therapy designed to change the way participants think and behave in relation to chronic pain, and has been found effective at reducing chronic pain levels, both in addition to medical treatment and as a freestanding treatment. One common assessment of the psychological changes resulting from CBT is the measurement of changes in quality of life ratings. Emotional instability has been shown to predict several psychological problems, such as depression, anxiety, sleep disorders, and difficulties in interpersonal relationships, all of which can have a negative impact on quality of life. This study examines the effects of emotional instability on patient outcomes of CBT for chronic pain as measured by quality of life. Participants in this study ($N = 316$; 63.9% female; 83.9% Caucasian) were included based on history of chronic pain and completion of CBT for chronic pain. Quality of life was assessed using the WHOQOL-BREF survey. Emotional instability was assessed using scales from the PAI. The results show that CBT is an effective therapy for chronic pain regardless of emotional instability levels, and that emotional instability levels are inversely related to chronic pain. Future research and clinical implications are discussed.

Keywords: chronic pain, emotional instability, quality of life, psychological intervention

The Effects of Emotional Instability on Quality of Life in Chronic Pain Patients Undergoing Cognitive Behavioral Therapy for Chronic Pain

Chronic pain is a long-term, persistent state of pain which often has a debilitating effect on the activities of daily living. The results of two different studies (Inoue et al., 2015; Stubbs, Schofield, & Patchay, 2016) suggest chronic pain affects millions and carries with it significant physical, financial, and social burdens. Several studies have been conducted to assess the effects of chronic pain on overall quality of life, as well as the effectiveness of several treatment methods. Cognitive behavioral therapy (CBT) for chronic pain is a non-pharmacological treatment method which has been shown to reduce chronic pain and improve the overall quality of life in chronic pain patients. Research into the effects of CBT has shown that differences within the individual may mitigate the effectiveness of CBT for chronic pain. One such mitigating variable, emotional instability, has received little attention prior to this study. This study examined the effects of emotional instability on changes in quality of life resulting from CBT for chronic pain.

Chronic Pain

Although many different definitions of chronic pain have been posited, most are varied and disparate in relation to the clinical discipline of the writer. Despite this variation, almost all definitions share some common aspects. Considering the most common viewpoints, one overarching definition can be synthesized. For the purpose of this study, chronic pain is defined as a complex and subjective experience (Knoerl, Smith, & Weisberg, 2016) which lasts longer than six months after initial insult (de Figueiredo & Griffith, 2016) or longer than the expected time frame for healing (Annagur, Uguz, Apiliogullari, Kara, & Gunduz, 2014), associated with negative emotional experiences (Ojala et al., 2015), influenced by biological, psychological, and

social factors (Knoerl et al., 2016), related to chronic pathologic processes which result in the experience of pain which may continue in the absence of demonstrable pathologies with little or no relief from typical pain management methods (de Figueiredo & Griffith, 2016), and has a debilitating effect on the activities of daily living (Knoerl et al., 2016). When viewed as a whole, this broad definition shows the incredible complexity of the construct of chronic pain.

Chronic pain is frequently associated with several negative ramifications. According to Knoerl et al. (2016), chronic pain often results in or co-occurs with sleep disturbance, anxiety, depression, decreased physical function and quality of life, impaired social and family relationships, and job loss. Chronic pain affects an estimated 100 million Americans, including approximately 50% of community-dwelling older adults (Stubbs et al., 2016). In a study reported by Inoue et al. (2015), individuals in the United States suffering from chronic pain lost approximately 101.8 million work days over the course of one year for chronic pain-related reasons. In a further study reported by Inoue et al., an average of \$4607 per employee was lost over the course of one year for chronic pain-related healthcare, including lost wages, medical care, and pharmacy costs. Clearly, the impact of chronic pain demands more extensive research.

Previous research has revealed some evidence as to the origins of chronic pain. Under normal conditions, pain serves as a warning signal of impending physical injury or illness. When pain becomes chronic, the warning signal loses its meaning, and the pain becomes a sensory experience in itself (Jonsdottir, Aspelund, Jonsdottir, & Gunnarsdottir, 2014). The sensation of pain that persists well beyond the normal time of healing for a specific injury often results from permanent changes in central nervous system processes (Knoerl et al., 2016). This sensation of chronic pain may be felt in the area of the original injury, or in another area of the

body within the same or adjacent dermatomes. Therefore, the person in pain may have difficulty in understanding the relationship between current pain perceptions and previous injuries.

Changes in the central nervous system can be understood using Gate Control Theory. According to this theory, descending modulation from the frontal cortex, limbic system, and hypothalamus, which govern cognitive thought, emotion, and regulatory processes, respectively, influences the transmission of pain signals through the dorsal horn of the spinal cord through the effects of neurotransmitters, endorphins, and hormones (Knoerl et al., 2016). Neuromatrix Theory, a revision of Gate Control Theory, suggests that sensory inputs may disrupt the homeostatic patterns resulting from bottom-up processing of pain and top-down processing of analgesic demands. As the danger being signaled by the chronic pain has long since been removed, the perception of pain becomes a freestanding sensory input, resulting in constant demands for analgesia and thus increasing cognitive demands of attention to the pain (de Figueiredo & Griffith, 2016). This increased demand for attention to pain results in a prolonged stress state resulting in increased release of cortisol, which in turn leads to degradation of muscle, bone, and neural tissue, thus further increasing pain sensations (Knoerl et al.).

In addition to physiological aspects, psychosocial factors may also result in a predisposition for chronic pain. Per a study reported by Saariaho, Saariaho, Karila, and Joukamaa (2011), out of 271 chronic pain patients who participated in the study, approximately half of the participants reported being currently under the care of a mental health provider. Also, a statistically significant correlation was found between chronic pain and childhood physical, sexual, or emotional abuse. Although correlations do not imply causation, it is interesting to note that this correlation was not found in the control group. Also, according to Inoue et al. (2015), found individuals who live alone or are divorced to have a higher prevalence of musculoskeletal

pain. The study also found that participants who live alone report more intense chronic pain than do participants who live with three or more people. Clearly, chronic pain is influenced by both biological and psychosocial factors.

While the subjective experience of chronic pain may differ from person to person, the results of these experiences are often similar. Per a study by Ojala et al. (2015), the typical psychological response to chronic pain often includes distress, anxiety, fear, sorrow, and despair. Participants reported both physical and emotional lability, exhaustion, depression, and uncertainty over the future, as well as changes in life in consequence of chronic pain, such as losses ranging from work to friends, the formation of a new 'pain identity', and a new definition of normal life. The study also reports these responses as more distressing than the chronic pain itself. When one of these responses became in any way exacerbated, pain intensity often increased, and further deteriorated participant quality of life. These psychological responses can, therefore, be seen as amplifiers of the distress caused by chronic pain.

In addition to these psychological responses, chronic pain may also introduce other physical difficulties. Chronic pain is associated with disability, mobility limitations, and functional decline (Stubbs et al., 2016). Chronic pain has also been found related to an increased risk of falls, fractures, and lower levels of physical activity, which can lead to muscle and bone hypertrophy, thus exacerbating decreased activity and chronic pain. These physical difficulties, in turn, give rise to further psychological concerns, such as decreased balance confidence and excessive concerns over the consequences of falling. As can clearly be seen, chronic pain creates within the sufferer a self-perpetuating cycle through the interplay of physical and psychological concerns.

Sleep difficulties are another common complaint in chronic pain patients. A recent study by Annagur et al. (2014) found a direct relationship between the degree of sleep disturbance and the intensity of pain. Sleep disturbance, depression, and chronic pain share a unique relationship, in that the existence of one can lead to the development of the other two. Both depression and chronic pain can result in decreased serotonin production, thus resulting in sleep disturbance. Chronic pain and sleep disturbance are both diagnostic criteria for depression under the Diagnostic and Statistics Manual of Mental Disorders (5th ed.; *DSM-5*; American Psychiatric Association, 2013), and both sleep disturbance and depression can result in chronic pain through somatic manifestations. Sleep disturbance also often leads to both increased health care utilization and anxiety, thus further perpetuating the feedback loop between physical and psychological aspects of chronic pain.

Due to the overwhelming psychological issues involved with chronic pain, it is not surprising that many chronic pain patients suffer from at least one psychiatric disorder. Annagur et al. (2014) reported that in a study based on structured clinical interviews, between two-thirds and three-fourths of chronic pain patients also suffer from a comorbid psychological disorder. The most commonly diagnosed psychological disorder was Major Depressive Disorder, followed by somatoform disorders, and Generalized Anxiety Disorder. These psychological disorders, along with sleep disorders and pain intensity, have been cited in a recent study as a causal link between chronic pain and increased risk of suicide (Trinanes, Gonzales-Villar, Gomez-Perretta, & Carrillo-de-la-Pena, 2015). As compared to the general population, chronic pain patients were found to have more than double the risk of suicide. Their study reported finding suicidal ideations in 20% of chronic pain patients, and suicide attempts in 5-14% of chronic pain patients.

Clearly, these overwhelmingly negative effects of chronic pain demand further research into patient variables that may be used to mitigate these effects.

The physiological and psychological effects of chronic pain may not only exacerbate the experience of chronic pain within the chronic pain patient but may also create difficulties in regards to treatment. Comorbid occurrences of pain in the absence of obvious injury, sleep disturbances, and psychological symptoms such as depression or anxiety can create difficulties for the practitioner in determining the root of the problems (Knoerl et al., 2016). For example, pain-related depression and anxiety may not respond to standard best practice methods for non-pain-related affective symptoms. The results of a study by this research team demonstrated a rebound effect in quality of life ratings in participants with depression and anxiety when those disorders were present prior to the onset of chronic pain. In these participants, quality of life initially increased as a result of psychological intervention for chronic pain, followed by a rapid return to a previous level (Seemann et al., 2016). Moreover, if the patient reports the presence of pain in multiple sites, the practitioner will often spend time searching for a non-existent causal link between the multiple areas. These physical and psychological comorbidities constitute only a portion of the difficulties in treating chronic pain.

Other difficulties in chronic pain treatment tend to be psychosocial in nature. One major barrier to treatment efficacy, or even receiving treatment, is gender. Schneider and Hadjistavropoulos (2004) report that men generally have a more negative attitude toward seeking help and receiving therapy than women. This negative attitude can cause the male chronic pain patient to put off seeking treatment for his chronic pain until the pain becomes unbearable, thus creating more difficulties for both patient and practitioner. Suso-Ribera et al. (2016) also report that frustration from failed attempts to control pain may also increase the subjectively negative

experience of chronic pain. This increased pain may have the same effect as positive punishment, thereby decreasing the likelihood that the patient will seek further measures to reduce pain levels. Also, Matos, Bernardes, and Goubert (2016) cite social support as another possible barrier to chronic pain treatment. If the chronic pain patient receives support from family and friends to maintain a level of physical activity despite the pain, such as taking short walks with a spouse, this support may serve to improve the efficacy of treatment. Conversely, social support that encourages the patient to avoid pain at all costs may reinforce the ideas of dependence and inadequacy. This dependence-fostering type of social support, along with physical and psychological comorbidities, gender-related norms, and previous failed attempts to control chronic pain constitute barriers to treatment that must be addressed by both provider and patient for treatment to be as effective as possible.

Psychological Intervention for Chronic Pain

Considering these barriers to treatment, as well as other variables specific to each chronic pain patient, effective pain management often proves challenging. According to a recent meta-analysis (Knoerl et al., 2016), only about half of chronic pain patients experience clinically significant pain relief due to pharmacological intervention. Thus, multidimensional approaches, including direct therapies for physiological, psychological, and sleep issues, are necessary to effectively manage chronic pain and the associated psychological and physiological symptoms. In addition to the improved patient outcomes in the half of chronic pain patients who experience little or no relief through pharmacological intervention, the addition of psychological intervention may also improve treatment results in patients who do experience significant relief, thereby improving overall patient outcome, and reducing the need for higher doses of pain management medication.

Psychological intervention effects chronic pain by actively retraining cognitive processes. Neural pathways which have been modified by chronic pain result in cognitive processes which lead to dysfunctional thoughts and behaviors, such as pain catastrophizing cognitions, thus compromising the biopsychosocial health of the chronic pain patient (Castro, Daltro, Kraychete, & Lopes, 2012). A recent study has shown that patients with greater pain catastrophizing cognitions had greater difficulty in redirecting attention away from pain (Wong et al., 2014). This would seem to suggest that, for pain management to be most effective, neural pathways must be retrained to perform a more functional role.

In addition to the negative consequences of dysfunctional cognitive processes, chronic pain patients may also lack a fundamental understanding of chronic pain and its effects. The primary role of pain is to serve as a warning of imminent tissue injury. In chronic pain, however, the danger no longer exists. Therefore, King, Robinson, Ryan, and Martin (2016) propose that the acquisition of a new understanding of the less threatening nature of chronic pain may be beneficial in psychological pain management. Ojala et al. (2015) also suggest pain education for the chronic pain patient to correct maladaptive thoughts or beliefs about chronic pain. Thus, chronic pain education has become a significant part of many psychological interventions for chronic pain.

Several different modalities of psychological intervention for chronic pain exist, ranging from psychoanalytical to humanistic. While there may be significant differences between methods of psychological intervention for chronic pain, the efficacy of any psychological intervention relies on the ability of the therapist to empathize with the patient, the trust of the patient on the therapist, the expectations of the patient, and the nature of the therapist-patient relationship (de Figueiredo & Griffith, 2016). The complexity of the pain neuromatrix offers

multiple points of entry for psychological intervention, either by modulating the bottom-up transmission of pain information or by increasing the efficacy of top-down pain regulation. Regardless of the theoretical affiliation of the therapist, psychological intervention may help reduce the suffering and intensity of chronic pain by modulating the regulation of the amygdala, insula, and ventral anterior cingulate gyrus by the prefrontal cortex and the dorsal cingulate gyrus. Therefore, effective psychological intervention for chronic pain can take many forms, focusing on changes in language, cognitive style, behavior, relationships, attitudes toward pain, and awareness of the body.

Many different psychological interventions for chronic pain exist. Cognitive behavioral therapy is one such intervention that has been the subject of many randomized controlled trials and has been found to be an effective therapy for chronic pain (Knoerl et al., 2016). CBT is an APA-approved treatment modality for chronic pain which relies on the patient's active involvement (Thorn, 2004). CBT consists of exposure therapies such as flooding, systematic desensitization, and imaginal exposure, as well as behavioral therapies such as behavioral experiments, behavioral activation, relaxation training, and skills training, and talk therapies including cognitive restructuring, schema therapy, goal setting, and problem solving (Levita, Duhne, Girling, & Waller, 2016), and often includes aspects which address sleep hygiene (Knoerl et al.). For chronic pain patients, CBT may be an effective addition to existing medical treatment.

While specific components of CBT may differ based on individual needs of the patient or professional standpoint of the therapist, virtually all CBT's rely on three key components. Cognitive restructuring involves identifying automatic negative thoughts and their resulting behaviors in an effort to develop more adaptive coping thoughts and behaviors (Knoerl et al.,

2016). Relaxation training includes strategies such as deep breathing, progressive muscle relaxation, and visualization to reduce muscle tension and alter the perception of physical pain. Behavioral activation helps individuals schedule their activities based on time or quotas, rather than based on pain, to maximize their ability to function through chronic pain. These three key components make up the core of any cognitive behavioral therapy.

Despite some small discrepancies in content, very little variation exists in the delivery of CBT. CBT for chronic pain is typically delivered in individual or group counseling sessions over the course of several weeks (Knoerl et al., 2016), and requires the patient's active participation, relying on the therapist only as a guide, rather than as a provider of interventional therapy (de Figueiredo & Griffith, 2016). This active patient participation can help the patient to develop improved emotional regulation, while at the same time reducing stress and feelings of incompetence by instilling in the patient a new understanding of chronic pain. This new way of thinking results from changes in neurotransmission in the prefrontal cortex which can be seen using functional magnetic resonance imaging. Thus, Knoerl and colleagues found that 43% of participants in their study realized significant pain reduction as a result of CBT without medical intervention, and 73% of those continued to experience reduced pain levels at 6-month follow-up. The efficacy of CBT for reducing chronic pain, pain interference, and pain-related anxiety and depression (Ehde, Dillworth, & Turner, 2014; Seemann et al., 2016) has been well established in existing literature. Thus, CBT has become the gold standard psychological intervention for chronic pain.

Quality of Life

The efficacy of CBT in reducing chronic pain can be measured in several ways. One commonly used method of assessing patient outcomes in CBT for chronic pain is the measuring

of changes in quality of life pre- and post-therapy. Quality of life is a complex concept, encompassing aspects of life such as physical, psychological, and social well-being and financial stability (Kapuria, 2016), cognitive and emotional life evaluations, including happiness, peace, fulfillment, and satisfaction (Stewart, Reynolds, Jones, Stewart, & Nelson, 2016), and the individual's perception of their position in life in relation to cultural and personal value systems, and in relation to their goals, expectations, standards, and concerns (Schuch et al., 2016). Quality of life can be affected by chronic pain as a result of mobility limitations (Stubbs et al., 2016), depression and anxiety (Inoue et al., 2016), pain catastrophizing and a desire to escape from pain, often including suicidal ideation (Trinanes et al., 2016), pain frequency and intensity (Jonsdottir et al., 2014), demoralization, and disruption of emotion and thought patterns through attentional demand from chronic pain (de Figueiredo & Griffith, 2016), resulting in a measurable decrease in overall quality of life (Jensen, Ehde, & Day, 2016). Clearly, quality of life can effectively demonstrate changes as a result of the effects of CBT on chronic pain.

Many instruments exist to measure quality of life. One such instrument which has been used in myriad studies because of its documented reliability, internal consistency, and discriminant and construct validity is the World Health Organization Quality of Life Brief (WHOQOL-BREF) survey (Shawver et al., 2016). The WHOQOL-BREF was developed by the World Health Organization using a cross-sectional design, assessing its psychometric properties with over 10,000 participants in 23 countries, resulting in an instrument that accurately measures the physical, psychological, social, and environmental domains of quality of life. Hsiao, Wu, and Yao (2014) conducted an independent examination of the WHOQOL-BREF and found moderate correlations between the four domains. From this, Hsiao and colleagues suggest that the four domains, although inherently related, are separate constructs,

measuring different aspects of quality of life. Thus, they conclude that these four domains together can be regarded as indicators of an overall quality of life factor.

Emotional Instability

In the relationship of the effects of CBT in chronic pain patients as measured by quality of life changes, one final construct must be discussed, the construct of emotional instability. Emotional instability has been described as a measure of the frequency, speed, intensity, and rate of change in emotional states (Stevenson, Dvorak, Kuvaas, Williams, & Spaeth, 2015). According to Maples, Miller, Hoffman, and Johnson (2014), emotional instability is a stable trait of rapid changes in affect as a result of extreme sensitivity to meaningful events. Emotional instability has been linked to dissatisfaction with both self and life experiences, as well as interpersonal problems, anxiousness, cognitive distortions, identity problems, suspiciousness, insecure attachments, and social avoidance. Emotional instability has also been shown to subsume trait neuroticism and to inversely relate to trait agreeableness (Jang, Dick, Wolf, Livesley, & Paris, 2005). Emotional instability is also a key finding in borderline personality disorder and bipolar mood disorder, and has also commonly been found in depressive, post-traumatic, premenstrual, and eating disorders, as well as alcohol abuse, seizures, and brain lesions, and is a predictive factor of suicide attempts, inappropriate anger, relationship conflicts, and intimate partner violence (Carlo et al., 2012; Renaud & Zacchia, 2012; Maples et al., 2014; Selby et al., 2015). Given the previously mentioned literature on the psychological effects of chronic pain, the link between chronic pain and emotional instability can easily be understood.

Emotional instability can also have a negative effect on quality of life. As reported in Jang et al. (2005), emotional instability has been shown to subsume trait neuroticism, which has been linked to significantly reduced ratings of quality of life (Suso-Ribera & Gallardo-Pujol,

2016). Neuroticism is also connected with increased perceptions of pain, thus further decreasing quality of life ratings in chronic pain patients high in emotional instability. Emotional instability could also serve to decrease quality of life through further relationships with problematic drinking patterns (Marwaha, Balbuena, Winsper, & Bowen, 2015; Stevenson et al., 2015), depression, and sleep difficulties, as well as increased impairment within romantic relationships, family relationships, and close friendships.

The causes of emotional instability remain as yet unclear. Per Marwaha et al. (2015), evidence suggests that abnormalities in the amygdala, and the resultant abnormal connections to the prefrontal cortex, are involved in emotional instability. Marwaha and colleagues also cite variation in the serotonin transporter gene which has been linked to trait neuroticism as one possible modulator of emotional instability. From this, the researchers conclude that emotional instability may be connected to sleep abnormalities and depression. Emotional instability often results in cognitive arousal which lasts long past the emotional reaction, thus potentially disrupting sleep patterns. Poor sleep quality has been shown to produce or exacerbate both emotional instability and depression, both of which may also predict sleep abnormalities, thus creating yet another positive feedback loop within the relationship between chronic pain and quality of life.

Unlike measurement of quality of life, one well-established and generally accepted measurement device does not exist for emotional instability. Although two instruments do exist for the measurement of emotional instability, the Affective Lability Scale and the Affect Intensity Measurement, both have received considerable criticism in terms of validity (Maples et al., 2014). Therefore, the most commonly used technique for assessing emotional instability, as described in Renaud and Zacchia (2012), is to use scales from the Personality Assessment

Inventory which measure aspects related to emotional instability. These scales can be averaged to produce an overall rating of emotional instability.

Hypotheses

Patient outcomes of CBT for chronic pain as measured by quality of life have been the subject of numerous studies. Few studies, however, have attempted to measure possible mediators of these outcomes (Akerblom, Perrin, Fischer, & McCracken, 2015), such as emotional instability. When examining the available literature into the effects of emotional instability on patient outcomes in CBT for chronic pain, a gap in the scientific knowledge base presented itself. Considering the available literature, I investigated the following four hypotheses. First, I hypothesized that I would find a significant increase in all domains of quality of life between initial and final assessment over the course of 12 sessions of CBT for chronic pain in all categories of emotional instability. Also, I hypothesized that I would find significant differences in quality of life ratings between the three emotional instability groups at each measurement. Next, I hypothesized that quality of life ratings would be negatively related to emotional instability such that participants in the High emotional instability category would show the lowest mean quality of life ratings. Finally, due to the relationship between emotional instability and depression and anxiety, I hypothesized that I would find a rebound effect in quality of life ratings in the Low emotional instability group.

Method

Participants

Participants in this study ($N = 316$) were chronic pain patients undergoing CBT for chronic pain at a mid-sized tertiary multidisciplinary pain management facility in Huntsville, AL. Participants were 63.9% female, 83.9% Caucasian, 15.8% African-American, and one participant

(0.3%) identifying as 'other'. The mean participant age was 46.83 years ($SD = 10.99$; range 19.1 – 79.9). Participants were gathered from the participant pool of a larger ongoing study of chronic pain patients who have undergone CBT at the host facility.

As a requirement to be accepted for chronic pain treatment at this facility, and therefore for inclusion in this study, moderate to severe chronic pain refractory to traditional pain management techniques must have been documented in medical records for a minimum of six months prior to initial presentation. Given the nature of chronic pain as persistent and ongoing, the six-month minimum requirement, and the subjective and variable nature of recollections of pain, duration of pain condition was not recorded. The most common of the 13 reported pain locations was lower back (32.9%), which includes pain originating in the lower back and radiating into adjacent areas, followed by multiple pain sites (29.1%), categorized as pain in multiple non-adjacent areas (i.e. upper extremity and knee), usually resulting from auto accidents, assaults, or fibromyalgia, with all other pain sites being reported by less than 10% of all participants.

Inclusion in this study from the larger participant pool ($N = 1548$) was based on completion of CBT for chronic pain. Only participants who had already completed all 12 sessions in the host facility and consented to participate in the study ($N = 564$) were considered for inclusion. As this study includes a within-subjects design, it was imperative that all data be complete to ensure the accuracy of the statistical analysis. Therefore, only participants who answered every question on all pertinent questionnaires were included, resulting in a total population of $N = 316$. All participants consented to participate in this study with no ramifications for either participating or opting out. All HIPAA, APA, AMA, and Human Subjects standards were followed.

Design

This study employed a 4 x 3 (QOL x emotional instability group) repeated measures design. Quality of life was manipulated by CBT for chronic pain, and measured across physical, psychological, environmental, and social domains. QOL was assessed using the WHOQOL-BREF, comprised of 26 questions answered on a 5-point Likert-type scale. Scores were then entered into SPSS and converted into a score on a 1 – 100 scale for each domain based on published scoring methods.

Participants were categorized as either Low, Average, or High emotional instability based on answers to the Personality Assessment Inventory, a 344-question self-report personality questionnaire. Correlations were used to determine the relationship between the non-support scale, the affective instability, negative relationships, social detachment, and persecution subscales, and changes in quality of life ratings. The Personality Assessment Inventory was scored using T-tests, resulting in scores which range from 0 – 115. Scores from the aforementioned scales and subscales of the Personality Assessment Inventory were then averaged for each participant, giving an overall rating of emotional instability. These ratings were partitioned at the natural division of one standard deviation above and below the mean, creating our experimental groups of Low, Average, and High emotional instability. Results were analyzed using four repeated measures ANOVAs, one for each domain of QOL, for each category of emotional instability, totaling 12 repeated measures ANOVAs, with post hoc Tukey's HSD to assess both within- and between-group differences.

Materials

CBT for chronic pain was conducted in group sessions once per week in a designated conference room within the host facility in accordance with published and accepted standards

(Thorn, 2004), by a licensed practicing psychologist with over 30 years of experience. As several participants suffered from limited mobility and relied on friends and family members for transportation and financial support, participants were allowed to attend CBT as scheduling for all parties involved allowed, although participants were encouraged to participate on a weekly basis. Approximately 12% of participants completed CBT in less than 16 weeks, with the majority (72.5%) completing between 17 and 31 weeks. The longest completion time was 85 weeks.

Due to the fluid nature of the week-to-week participation in CBT, and although group sessions followed a predetermined schedule, sessions were conducted in order to achieve the maximum benefit for the highest number of participants in attendance in any one session. As a result, it would be impossible to ensure that every participant received the exact same therapy, but, as participants must complete 12 sessions of CBT in order to be included in this study, it can be assumed that all participants received at least a moderate exposure to behavioral change-based therapy, including behavioral activation, relaxation training, and skills training, as well as talking-based therapy, such as cognitive restructuring, schema therapy, goal setting, and problem-solving.

Quality of life was assessed using the World Health Organization Quality of Life Survey Brief form. This survey consists of 26 questions designed to assess the physical (7 questions), psychological (6 questions), social (3 questions), and environmental (8 questions) domains of quality of life. Reliability and validity measures of the WHOQOL-BREF have already been presented in this paper. Participants completed the WHOQOL-BREF in the conference room where group therapy sessions were conducted prior to the beginning of the first session of CBT, and then again at four, eight, and 12 weeks. The WHOQOL-BREF was administered and

collected by facility staff. Responses were then scored using SPSS and entered into an Excel spreadsheet with all patient identifiers removed.

Emotional instability was measured using the Personality Assessment Inventory similar to the technique used by Maples et al. (2014). The Personality Assessment Inventory is a 344-question self-report questionnaire designed to measure clinical determinants of personality. The present study utilized scores from non-support scale, as well as the negative relationships, social detachment, persecution, and affective instability subscales to compute one overall rating for emotional instability. These five subscales were used due to evidence of a relationship between these scales and emotional instability in available literature (Jang et al., 2005; Maples et al., 2014; Selby et al., 2015), and due to significant correlations between these scales and QOL scores specific to this quasi-experiment across all four domains.

The scores from these five scales were averaged for each participant to produce a rating for emotional instability. These ratings were then averaged to determine both group mean and standard deviation, and then categorized into experimental groups of either Low, Average, or High emotional instability, with categories partitioned at the natural division of one standard deviation above and below the mean. The Personality Assessment Inventory was administered, scored, and interpreted by a licensed practicing psychologist. Administration of this instrument took place in one or two one-hour office visits, typically within one week prior to or following the eighth session of CBT.

Procedure

Participants engaged in CBT for chronic pain as described above. After consent to participate was secured, all WHOQOL-BREF assessments were administered prior to the beginning of the session at initial presentation, and again at the fourth, eighth, and 12th sessions.

Participants completed the Personality Assessment Inventory in the office of a licensed practicing psychologist on staff at the host facility, typically within one week of the third WHOQOL-BREF assessment at session 8. All data were collected by trained staff at the host facility and maintained in electronic medical records. All HIPAA, APA, AMA, and Human Subjects guidelines were followed.

Statistics

After all data had been entered into electronic medical records by facility staff, data were then collected from electronic medical records by a trained researcher and entered into an Excel spreadsheet kept on a password-protected computer in a locked room. After removing any personal identifiers, data were then analyzed via SPSS using 12 repeated measures ANOVAs to assess changes in QOL in relation to emotional instability, as well as post hoc Tukey's HSD to assess a priori hypotheses of between-group changes in QOL ratings at each measurement.

Results

Descriptive data is shown in Table 1. Twelve repeated measures ANOVAs were analyzed using each domain of quality of life as factors to determine within-group differences. The results of the four ANOVAs for each emotional instability category show within-subjects main effects for all four domains of quality of life from initial to final assessment. A significant main effect was found in all categories across all domains. The results of the twelve ANOVAs are as follows: psychological High, $F(1, 64)$, $MSE = 137.03$, $p < .001$, $\eta^2 = 0.41$, psychological Average, $F(1, 206)$, $MSE = 140.91$, $p < .001$, $\eta^2 = 0.31$, psychological Low, $F(1, 43)$, $MSE = 128.64$, $p < .001$, $\eta^2 = 0.34$; social High, $F(1, 64)$, $MSE = 249.73$, $p < .001$, $\eta^2 = .12$, social Average, $F(1, 206)$, $MSE = 256.53$, $p < .001$, $\eta^2 = 0.18$, social Low, $F(1, 43)$, $MSE = 139.54$, $p = .004$, $\eta^2 = 0.18$; environmental High, $F(1, 64)$, $MSE = 172.62$, $p < .001$, $\eta^2 = .27$, environmental

Average, $F(1, 206)$, $MSE = 95.96$, $p < .001$, $\eta^2 = 0.33$, environmental Low, $F(1, 43)$, $MSE = 77.59$, $p < .001$, $\eta^2 = 0.30$; physical High, $F(1, 64)$, $MSE = 119.35$, $p < .001$, $\eta^2 = .57$, physical Average, $F(1, 206)$, $MSE = 154.46$, $p < .001$, $\eta^2 = 0.51$, physical Low, $F(1, 43)$, $MSE = 126.22$, $p < .001$, $\eta^2 = 0.69$. These results indicate a significant increase in every domain in all emotional instability categories from initial to final assessment, as predicted by Hypothesis 1. Table 2 shows mean scores in each domain for each category of emotional instability. Figure 1 shows the same data in a bar chart. Table 3 shows mean instability scores within each category of instability.

Table 2 and Figure 1 also include a category labeled QOL 1 – 4. The means in this category were found by averaging the individual scores of the four domains of quality of life to produce an overall quality of life rating. Although correlations have been found (Hsiao, Yao, & Wu, 2014) within the four domains of quality of life, suggesting that each may serve as a predictive variable for the others, this method of generating an overall quality of life score has not been assessed for psychometric reliability and validity to my knowledge. It is interesting to note, however, that in every instance, the means for this ad-hoc measure of global quality of life showed a statistically significant increase at every assessment.

Hypothesis 2 stated that I expected to find significant differences between emotional instability groups at each measurement. Table 3 demonstrates mean instability levels within instability categories. Tables 4 – 7 demonstrate differences between the three emotional instability groups at each measurement for all four domains of quality of life. As can be seen from these tables, significant differences were found between the three levels of emotional instability in all four measurements of all four domains of quality of life, with two exceptions.

While the differences do exist, the Low-to-Average comparisons in the first two assessments of physical quality of life, as demonstrated in Table 7, were not significant.

Hypothesis 3 predicted that quality of life would respond to emotional instability such that participants in the high category of emotional instability would show the lowest ratings of quality of life. With the exception of the Low vs Average comparison in the first two measurements of the physical domain, an inverse relationship was found between emotional instability and quality of life in all other instances. Tables 4 – 7 demonstrate differences between Low and Average emotional instability and Average and High emotional instability for each measurement of all four domains of quality of life. For a direct comparison of means, see Table 2 and Figure 1. Table 8 demonstrates significant negative correlations between emotional instability and all four domains of quality of life, suggesting that, as emotional instability increased, quality of life decreased.

Hypothesis 4 stated that I expected to find a rebound effect in quality of life mean ratings in the High emotional instability category. Despite the well-established relationship between emotional instability and both anxiety and depression, no significant negative deflection was found in any domain. Although not true rebound effects, three instances were found in which quality of life did not progress in a positive direction as expected. First, a negative deflection was found between the first and second assessments of quality of life in the social domain for the Low emotional instability category, followed by a sustained positive deflection after the third assessment. Second, for participants in the High emotional instability category, social quality of life showed no statistically significant change between the first three assessments, followed by a significant increase at the fourth assessment. Finally, a plateau was also found between

assessments two and three of physical quality of life in the Average emotional instability category.

Discussion

The results of the data analysis show that in all three categories of emotional instability, quality of life scores significantly increased between initial and final assessment of quality of life, as predicted by the first hypothesis. Evidence for this hypothesis should not be interpreted to mean that emotional instability has no effect on quality of life, as evidence for other hypotheses supports the effects of emotional instability on quality of life. The results cited in favor of this hypothesis do, however, suggest that CBT can have a significant effect on quality of life for participants in either category of emotional instability.

The results of the twelve ANOVAs show a robust effect size in all categories for the physical domain, moderate effect sizes in all categories for the psychological and environmental domains, and modest effect sizes for all categories of the social domain, suggesting that the physical improvements may be more salient to the participants. This is not surprising, as pain is primarily a physical construct. As suggested by Wong et al. (2014), this robust effect in physical quality of life may be due to the increased salience of pain as a result of emotional instability. The modest effect sizes for social quality of life could be a result of an interaction with another moderator, such as social support, as demonstrated in Matos et al. (2016). An alternative interpretation of the results could suggest that, as initial social quality of life scores were already at or above the mean, there was very little room for improvement in this domain. When compared to initial scores from other domains, however, this interpretation loses some credibility. Initial quality of life scores in the environmental domain in each category of emotional instability are higher than initial quality of life scores in the social domain within the

same categories, leaving less room for improvement in the environmental than the social domain, thus supporting the first interpretation. Therefore, CBT remains a viable addition to any pain treatment protocol.

Hypothesis 2 predicted significant differences in quality of life ratings between emotional instability groups at each measurement. Data analysis supports this prediction, with the exception of the Low-to-Average comparison in the first two assessments of physical quality of life. Participants in the Low and Average emotional instability categories may have been less hesitant to attempt to function physically without guarding against pain than those in the High category as a result of the decreased likelihood of pain catastrophizing cognitions (Wong et al., 2014). This could also explain the significant difference between the Average and High emotional instability groups, thus suggesting that participants in the High emotional instability group were more cognizant of their level of pain as a result of emotional instability, as in Suso-Ribera and Gallardo-Pujol (2016). Future research should consider this possible synergistic relationship.

The results of the data analysis show that in all four domains of quality of life, participants in the Low emotional instability category showed the highest quality of life scores and participants in the High emotional instability category showed the lowest quality of life scores, apart from the Low-to-Average comparisons in the first two measurements of physical quality of life. This would seem to suggest that emotional instability has a negative effect on quality of life, partially supporting hypothesis 3. Hypothesis 3 stated that emotional instability and quality of life would display a negative relationship. The non-significant comparisons in the physical quality of life domain have been addressed under hypothesis 2 and can be understood using the same interpretation with respect to the third hypothesis. The remaining data support

the hypothesis, as can be seen in Tables 4 – 8 and Figure 1. Thus, emotional instability can be understood as a negative predictor of quality of life.

Hypothesis 4 predicted that the High emotional instability category would demonstrate a rebound effect in quality of life ratings. The results of the data analysis show no such effect in any domain. The absence of a rebound effect in this study could be a result of the overestimation of the role depression and anxiety has in emotional instability. A more plausible explanation would suggest that, as the original study found a rebound effect in quality of life scores in participants with pre-existing clinical depression and/or anxiety and no rebound effect in participants with only pain-related depression and/or anxiety, the parameters of this study were too vague to detect a true rebound effect. This could explain the lack of significant results for this hypothesis, as the current study made no attempt to differentiate participants based on mental health history. Perhaps future researchers could examine this subject with respect to prior diagnosis of depression or anxiety.

The results of this study give rise to clinical implications. The obvious implication is that CBT has a positive impact on quality of life in chronic pain patients, and these positive impacts exist in all categories of emotional instability. Therefore, CBT for chronic pain should be considered a viable addition to any medical treatment for chronic pain. Also, as participants in the High emotional instability group never achieved quality of life increases above a score of 50 out of 100 with the exception of the environmental quality of life domain, practitioners should consider referring participants who score high in emotional instability for individual therapy for emotional instability before including the participant in CBT. Individual counseling could reduce the emotional instability felt by the participant, and therefore could move the participant

from the High category to the Average category. This could serve to improve participant quality of life scores prior to the beginning of CBT.

The results of this study give rise to several outlets for future research. One aspect of this research which warrants further attention is that of long-term patient outcomes. In this experiment, I only tracked quality of life changes over the course of CBT. Future research could conduct follow-up interviews and surveys to examine whether the quality of life-bolstering effects of CBT for chronic pain were sustained at 6-month, 9-month, 12-month, and 36-month follow-ups and beyond (Scott, Hann, & McCracken, 2016). The results of these future studies could determine if the skills and thought patterns gained through CBT were adaptable to new challenges at the patient level, as opposed to being only useful for the specific purpose of living with current levels of chronic pain. These long-term follow-ups could also track changes in pain level and intensity, thus affording the researcher the opportunity to examine the long-term efficacy of CBT for chronic pain in relation to new or increased pain levels, as determined by comparing these pain levels to quality of life ratings at each follow-up.

Another possible topic of future inquiry could be to examine other potential moderators of quality of life changes in CBT for chronic pain. According to Ehde et al. (2014) and Akerblom et al. (2015), very few studies have examined specific processes which mediate or mitigate changes in quality of life through CBT. Multiple pain sites, depressive symptoms, nonspecific physical problems, rumination, and catastrophizing are some possible change processes which may deserve further attention. The results of these future experiments could benefit patients by directing them to treatment options tailored to their specific mental and physical issues, and may eventually lead to the refinement of theoretical models, as well as the development of more effective therapies. Kerns et al. (2014) conducted an experiment

examining treatment outcomes in tailored vs. standardized CBT. Their results suggest that patient outcomes were no better in the tailored CBT group than in the standardized CBT group, but this was most likely due to methodological issues, rather than a true rejection of the hypothesis. In their study, CBT was tailored to individuals based on participant's rating of preferred CBT skills. Future research should examine the question of tailored CBT based on empirically validated treatment moderators.

One final area of future research concerns a refinement of the current study. The current study examined the effects of emotional instability based on deviation from mean instability ratings. Future research could further subjugate emotional instability levels within the current High instability group to determine differences in quality of life response in participants on the border between Average and High vs extreme High emotional instability participants. Future research could also include a qualitative aspect, considering the intensity and the levels of distress felt by the participant because of emotional instability (Spindler, Stopsack, Aldinger, Grabe, & Barnow, 2015). Research into this area could reveal the need of participants to be referred to a licensed therapist for counseling directly related to emotional instability before beginning treatment for chronic pain, thus removing or decreasing the treatment moderator, improving the overall outcome of CBT for chronic pain, and increasing the overall quality of life for the participant.

One possible limitation of this study is that all participants lived within driving distance of the host facility in Huntsville, Alabama. Although our sample did include participants from both urban and rural settings, as well as participants with a range of backgrounds, including farming, construction, military, food service, teaching, and professional careers (i.e. engineering, accounting), our sample only included participants from the southeastern United States.

Although emotional instability does seem to be a stable trait within the individual, this study does not consider regional or cultural differences that may be experienced. Future researchers could repeat this study in other locations to determine whether regional variations in emotional instability exist, and if those variations affect the effectiveness of CBT for chronic pain. One further limitation related to our population may be that 83.9% of our population were Caucasian. Future researchers should take this into account, in that this research may not adequately generalize to other ethnic groups.

Another limitation of this study involves the time to completion. Almost all our participants took longer than 12 weeks to complete CBT. The mean time to completion was 24.16 weeks, and although 267 participants completed CBT within one standard deviation above or below the mean, the overall time to completion ranged from 12 – 85 weeks. Such a wide range of completion time may have artificially inflated or deflated mean scores. In participants completing CBT at the higher end of the range, the additional time between assessments may have allowed the participant to more fully internalize the skills learned at the last sessions before adding new skills, thus possibly artificially inflating quality of life scores. Conversely, the additional time could have allowed participants time to forget skills from earlier sessions and revert to prior pain-focused cognitions and behaviors, thus artificially lowering quality of life scores. Preliminary statistical evaluation did not reveal a significant interaction between quality of life scores and time to completion based on the mean and standard deviation, but future researchers should control for this variable, either by more strictly controlling the procedure or by grouping participants by time to completion.

. In summation, emotional instability was found to be a significant mediator of changes in quality of life ratings in chronic pain patients undergoing CBT for chronic pain. Statistically

significant results were found in support of the first three hypotheses, with the exception of the between-group difference in the Low vs Average comparison in the first two measurements of the physical domain of quality of life. Hypothesis 4 was rejected completely, as no negative deflections were found beyond the second measurement in any domain of quality of life. From this, I concluded that quality of life significantly inversely related to emotional instability, and that this relationship significantly impacts outcomes of CBT for chronic pain.

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Table 1

Descriptive Statistics

Category	Frequency	%
Female	202	63.9
Male	114	36.1
African-American	265	83.9
Caucasian	50	15.8
Other Ethnicity	1	.3
Low Instability	44	13.9
Average Instability	207	65.5
High Instability	65	20.6
Low Back Pain	123	39.2
Multiple Pain Sites	67	21.3
Whole Body Pain	30	9.6
All Other Pain Sites	94	29.6

Table 2

Quality of Life Means by Emotional Instability Level

Category	Low Instability (<i>SD</i>)	Average Instability (<i>SD</i>)	High Instability (<i>SD</i>)
PSYCH 1	69.98 (17.39)	55.13 (18.69)	36.09 (17.42)
PSYCH 2	75.00 (14.71)	59.17 (17.88)	42.25 (15.96)
PSYCH 3	79.74 (11.42)	63.27 (16.29)	46.47 (17.42)
PSYCH 4	81.25 (10.99)	66.24 (16.47)	49.89 (18.03)
SOC 1	75.57 (16.90)	58.66 (23.18)	41.03 (21.11)
SOC 2	72.01 (19.49)	61.78 (21.55)	41.03 (19.51)
SOC 3	80.68 (14.69)	66.91 (19.18)	41.54 (19.40)
SOC 4	83.33 (16.57)	69.22 (18.57)	49.29 (20.91)
ENV 1	76.41 (14.37)	65.78 (16.53)	51.18 (16.44)
ENV 2	77.57 (12.40)	69.81 (15.14)	56.97 (14.16)
ENV 3	81.68 (12.66)	72.93 (14.68)	60.28 (11.61)
ENV 4	84.52 (11.83)	75.38 (14.35)	62.25 (15.72)
PHYS 1	37.34 (13.06)	33.53 (16.98)	24.12 (13.06)
PHYS 2	48.46 (15.85)	46.62 (16.64)	34.67 (14.27)
PHYS 3	53.57 (16.93)	47.03 (16.06)	36.85 (14.81)
PHYS 4	60.55 (16.64)	51.44 (17.59)	41.78 (15.59)
QOL 1	64.82 (13.36)	53.27 (15.17)	38.10 (13.46)
QOL 2	68.26 (11.15)	59.34 (14.13)	43.73 (12.47)
QOL 3	73.92 (10.71)	62.54 (12.98)	46.28 (11.67)
QOL 4	77.41 (11.58)	65.57 (12.94)	50.80 (13.17)

Table 3

Instability Level Means by Level

Category	Mean Instability Level	Standard Deviation
Low Instability	39.50	1.64
Average Instability	49.68	4.99
High Instability	67.54	5.95

Table 4

Mean Instability Level Between-Group Differences by QOL Psych Domain

Category	Mean Difference (SE)	<i>p</i>	<i>r</i> ²
PSYCH 1			
LOW vs. AVG	14.85 (3.03)	<.001	.09
AVG vs. HIGH	19.04 (2.60)	<.001	.17
PSYCH 2			
LOW vs. AVG	15.83 (2.84)	<.001	.11
AVG vs. HIGH	16.92 (2.43)	<.001	.15
PSYCH 3			
LOW vs. AVG	16.46 (2.65)	<.001	.13
AVG vs. HIGH	16.80 (2.27)	<.001	.17
PSYCH 4			
LOW vs. AVG	15.01 (2.69)	<.001	.11
AVG vs. HIGH	16.35 (2.30)	<.001	.16

Table 5

Mean Instability Level Between-Group Differences by QOL Social Domain

Category	Mean Difference (SE)	<i>p</i>	<i>r</i> ²
SOC 1			
LOW vs. AVG	16.91 (3.65)	<.001	.08
AVG vs. HIGH	17.63 (3.13)	<.001	.07
SOC 2			
LOW vs. AVG	10.23 (3.46)	=.009	.03
AVG vs. HIGH	20.75 (2.97)	<.001	.15
SOC 3			
LOW vs. AVG	13.78 (3.10)	<.001	.07
AVG vs. HIGH	25.37 (2.66)	<.001	.25
SOC 4			
LOW vs. AVG	14.11 (3.12)	<.001	.08
AVG vs. HIGH	19.93 (2.68)	<.001	.17

Table 6

Mean Instability Level Between-Group Differences by QOL Environmental Domain

Category	Mean Difference (SE)	<i>p</i>	<i>r</i> ²
ENV 1			
LOW vs. AVG	10.63 (2.70)	<.001	.09
AVG vs. HIGH	14.60 (2.31)	<.001	.13
ENV 2			
LOW vs. AVG	7.76 (2.42)	=.004	.04
AVG vs. HIGH	12.83 (2.07)	<.001	.12
ENV 3			
LOW vs. AVG	8.75 (2.30)	<.001	.06
AVG vs. HIGH	12.66 (1.97)	<.001	.13
ENV 4			
LOW vs. AVG	9.13 (2.38)	<.001	.06
AVG vs. HIGH	13.14 (2.04)	<.001	.13

Table 7

Mean Instability Level Between-Group Differences by QOL Physical Domain

Category	Mean Difference (SE)	<i>p</i>	<i>r</i> ²
PHYS 1			
LOW vs. AVG	3.81 (2.79)	NS	
AVG vs. HIGH	9.41 (2.39)	<.001	.05
PHYS 2			
LOW vs. AVG	1.83 (2.67)	NS	
AVG vs. HIGH	11.95 (2.29)	<.001	.09
PHYS 3			
LOW vs. AVG	6.53 (2.65)	=.037	.02
AVG vs. HIGH	10.19 (2.27)	<.001	.07
PHYS 4			
LOW vs. AVG	9.11 (2.83)	=.004	.04
AVG vs. HIGH	9.67 (2.43)	<.001	.06

Table 8

Correlations Between Instability and QOL Domains at Each Assessment

Category	Assessment 1	Assessment 2	Assessment 3	Assessment 4
PSYCH	$r = -.483$	$r = -.491$	$r = -.522$	$r = -.496$
SOC	$r = -.419$	$r = -.411$	$r = -.534$	$r = -.475$
ENV	$r = -.421$	$r = -.391$	$r = -.420$	$r = -.422$
PHYS	$r = -.236$	$r = -.262$	$r = -.301$	$r = -.308$

All correlations are significant at $p < .01$.

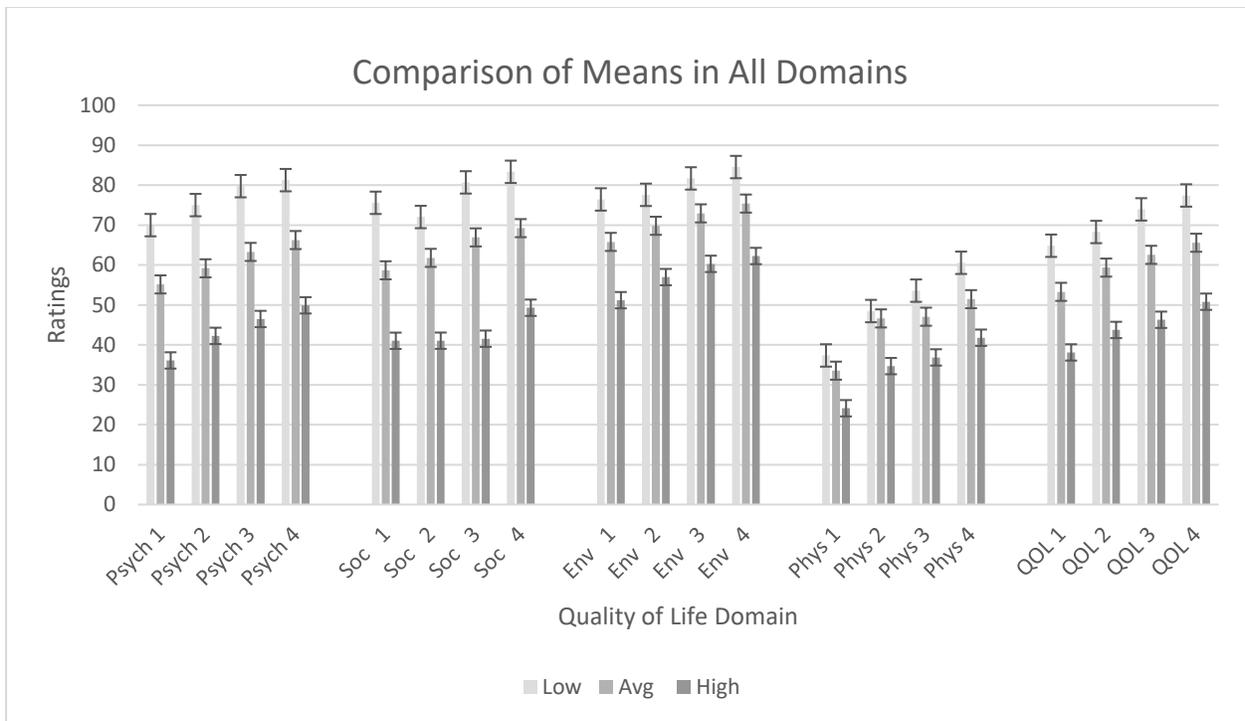


Figure 1. This bar chart demonstrates the relationship between quality of life ratings and emotional instability groups. With the exception of the Low vs Average emotional instability groups in the first two Physical measurements, quality of life ratings are always statistically highest in the Low emotional instability group, followed by the Average emotional instability group, and lowest in the High emotional instability group.