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Pain Management: Effects on Pain Perception in Older Adults and College Students

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Cover Page Note
I would like to acknowledge and extend a great thank you to Dr. Mattanah for helping me develop this project and his continued support throughout this process, family and friends for their ongoing support and encouragement and individuals who approached this treatment with an open mind and willingness to explore complementary and alternative therapies.

The general health and well-being of some people is compromised because of life circumstances such as chronic pain. Chronic pain can be defined as "pain without apparent biological value that has persisted beyond the normal tissue healing time, usually taken to be three months" (Harstall & Ospina, 2003, p.1). A 2011 report reveals that approximately 100 million adults suffer from a chronic pain condition (Institute of Medicine of the National Academics, 2011). Chronic pain affects both the person suffering directly by impacting the way they think, act and feel, and also has national consequences, costing an average $635 billion in annual medical expenses and lost productivity (Institute of Medicine of the National Academics, 2011). This data reinforces the importance of investment in pain research and treatment options because of the individual and national burdens this condition carries. The most prevalent option to treat pain in our society is pharmacological interventions, which, overall, has made strides in treatment of chronic pain conditions, yet for some do not offer relief (Beasley, Green, Greeson, Reibel, Jasser & Rosenzweig, 2010). Another emerging field that has caught the attention of researchers is alternative medical practices that may employ eastern therapies such as meditation. Meditation is the practice of internal, present-focused attention that holistically nurtures one's mind, body, and spirit. Meditation is showing promising results for decreasing the physical and psychological effects of chronic pain conditions (Beasley et al., 2010).

The primary aims of this study are to explore the effects of meditation on the perception of chronic pain and determine the differences in effectiveness in both the elderly and college students. A secondary aim is to study co-morbid psychological conditions associated with pain such as catastrophic thinking and stress, anxiety and depression (defined in this study as overall distress).

Review of Background Research

The International Association for the Study of Pain (IASP, 2011) defines pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage." Pain serves an adaptive condition that benefits individuals by alerting them of danger that is imposed upon their body. However, chronic pain has shown to be of no benefit to individuals (Preece, Rees, Schütze, M. & Schütze, R., 2010). It has been shown to be detrimental to many aspects of an individual's life including one's physical, emotional and psychological states (Beasley et al., 2010 & Greco & Morone, 2007).

In addition to the effects chronic pain evokes on an individual, it is important to look at the differences in reporting behaviors between older and younger adults on physical and psychological outcomes of chronic pain. Gagliese's (1997) research examined perceptions about pain in both younger and older adults as well as individuals with chronic pain and those without. This study yielded results that indicate an absence of differences in the appraisal of pain across conditions,

indicating that pain was not viewed as a typical condition of the aging process in both clinical and non-clinical samples. However, there are discrepancies in pain research highlighted by Gagliese & Melzack's (2003) findings that older adults reported significantly lower sensory-related pain ratings than younger adults. Still, it did not differ on ratings of pain intensity or overall distress. According to Gibson, Helme, Horne & Yong (2001), non-clinical samples of older adults may be underreporting pain-related symptoms due to a tendency to attribute pain to a "normal" sign of aging and therefore minimize their concern regarding sensory evaluations of pain. Due to inconsistencies in this domain, further research can increase our understanding of perceptual and reporting differences in regards to pain among diverse populations.

In order to further understand chronic pain, it is important to recognize what is responsible for the pain response in both the mind and body. The complexity of defining pain often comes from identifying the underlying factors that are responsible for it. Research on pain now attributes two components involved in the feeling of pain, the physical and psychological (sensation and affect) dimensions. These two dimensions often correlate with each other, illustrating the unity of the mind and body as a multifaceted and integrated system (Bushnell & Villemure, 2002). From a physiological standpoint, chronic pain is believed to be brought about by central sensitization, or "pain memories" (UCSF, 2007). These memories are created by tissue injury that persistently activates pain pathways in the brain that actually changes the mechanisms of the nervous system by enhancing the information being sent to the brain regarding the painful stimulus. In this sense, pain essentially wires the brain to expect intense pain in both pain-provoking and seemingly neutral situations (UCSF, 2007). In addition to mechanical changes, pain intensity and perception is shown to be highly dependent on psychological factors including affect-regulation, attention, awareness, emotional state, expectations and changes in consciousness. In this sense, chronic pain is not caused by the tissue damage; rather, it is the brain's interpretation of the stimulus that causes alarm within the body and ultimately causes individuals to feel pain (Bushnell & Villemure, 2002). This perceptual explanation of pain suggests co-morbidity among emotional and physical experiences of pain, where individuals who hold expectations and negative emotions surrounding pain often experience high levels of anxiety and hyper-vigilance by the constant reminder of the presence of pain in their lives. Bushnell & Villemure's (2002) research supports the aforementioned notion and points toward a potential self-regulatory model of pain perception. This model of pain perception states that changes in our mental states can influence and possibly reduce negative emotions towards pain as well as perceived intensity of the pain.

Pain perception may be more clearly explained by a leading theory in psychological research on chronic pain, the fear-avoidance model (FA). This

model predicts that an individual's perception of and reaction to pain sensations can directly affect future pain experiences (Preece, Rees, Schütze, M. & Schütze, R., 2010). The FA model highlights the mind's role in affecting and even transforming one's physical state. In relation to pain, maladaptive future views about pain such as catastrophic thoughts can predict negative health outcomes in one's physical, emotional and behavioral states. With chronic pain, a perpetual cycle is often created where the initial feeling of pain sends the body into "high-alert". These feelings of pain then continually re-activate a negative loop of fear and avoidance behaviors illustrated by the following steps 1. pain experience 2. pain catastrophizing 3. pain-related fear 4. avoidance/ hyper-vigilance 5. depression and disability. Because pain and fear are uncomfortable emotional states, one's normal reaction is to avoid these feeling through denial, isolation or a reduction in physical activity, behaviors that often cause emotional distress and more pain (Preece, Rees, Schütze, M. & Schütze, R., 2010). This model reflects how stored memories both in one's mind and body can create self-destructive situations and perpetuate a cycle of negative health consequences.

Conventional treatments of chronic pain take the form of pharmacological interventions to relieve individuals' symptoms, which have made significant strides for pain relief. However, for some individuals standard medical interventions do not offer relief. Others may experience negative side effects that cause both physical and emotional discomfort (Beasley et al., 2010). An emerging field in the treatment of chronic pain that has attracted the attention of researchers is alternative medical practices. These pain treatment strategies often employ eastern therapies such as meditation, yoga, and tai-chi. Meditation is the practice of internal, present present-focused attention that supports holistic nurturing of the mind, body, and spirit. (Beasley et al., 2010).

Mind-Body interventions encourage participants to train their mind in order to elicit a desired bodily response (Grossman, Niemann, Schmidt and Walach, 2004). Mindfulness meditation, one form of mind-body medicine helps train individuals to focus their attention inward on their thoughts, feelings, experiences and emotions without judgment in an effort to bring about a relaxed state of being (Beasley, et al., 2010). Mindfulness-based stress reduction (MBSR) programs are a hallmark of meditation interventions that employ a variety of techniques to help individuals gain more focused, non-judgmental awareness and ultimately produce positive health benefits such as the reduction of pain and co-morbid psychological conditions. It is important then to understand the many different components that contribute to these changes (Grossman, Niemann, Schmidt and Walach, 2004).

Beasley et al.'s (2010) research has found that by limiting excess mental activity and relaxing the body, meditation has shown to decrease reactivity which in turn reduces self-reported pain levels. Mindfulness meditation may be paradoxical, as its core teachings are that letting go of expectations and control,

yet by cultivating this practice, it actually empowers individuals by training them to call upon their own resources to bring about healing and overall wellness (Beasley et al., 2010). Results of Kabat-Zinn's (1982) study reinforce the notion that people often become consumed by the activities of their minds. These may include expectations, anticipations, thoughts, feelings, beliefs systems or opinions. The nature of our "mental noise" brings individuals out of moment-to-moment existence which puts us in a state of limbo, between anticipating the future, remembering the past and wanting to escape what is right in front of us. An individual who has practiced mindfulness meditation will often be able to "catch" their minds as they slip into these patterns and be able to bring their awareness back by either taking a deep breath or focusing on a bodily sensation (Kabat-Zinn, 1982 & Beasley et al., 2010).

Beasley et al. (2010) also found the benefits of mindfulness meditation in the core teaching of awareness without judging in order to calm the body. This rationale would require an individual to observe their pain as a mere bodily sensation, not better or worse than anything else they may feel that day. This practice is an effort to calm the alarm systems that are triggered by the pain responses. Mindfulness meditation may also help to reduce an individual's reaction to pain responses which may, for example cause catastrophic thoughts about pain to dissipate (Kabat-Zinn, 1982).

Focused attention on one's pain has shown to be a significant predictor in pain perception. Preece, Rees, Schütze, M. & Schütze, R., (2010) found that less focus on pain (more distraction) will often predict less pain. Distraction techniques that involve most of the sensory systems such as tactile, visual, or auditory stimulation seem to offer the best results for pain management. By employing techniques that draw focus away from pain, with suggestions of positive experiences and relaxation, one can actually decrease ones perception of pain without manipulating the physical stimulus that caused the pain reaction. Numerous investigations on the positive health benefits of distraction techniques such as guided imagery have been conducted. Guided imagery is a common MBSR exercise that encourages individuals to experience a pleasant mental journey while in a relaxed state. In particular, the Biard, Murawski & Wu (2010) study followed individuals diagnosed with osteoarthritis (OA) who received either guided imagery with relaxation or a "planned rest" control intervention. Results yielded significant decreases on pain scales and overall health-related quality of life (HRQOL) scales including: functional limitations, social support and activity, pain, tension and mood in those assigned to the guided imagery group. Because guided imagery encourages individuals to elicit these internal changes without the manipulation of a physical stimulus, its success is often recognized in its clinical and everyday application.

Building upon the practicality of meditation is its popularity, illustrated by the 1 out of 3 older adults who employed the practices of Complementary and Alternative Medicine (CAM) in 2007 (Greco, Monroe, & Weiner, 2007). Of these older adults, chronic pain was reported as the most prevalent reason for seeking this CAM. Greco, Morone, & Weiner (2007) found that an 8-week mindfulness based stress reduction (MBSR) program both reduced the older adult's levels of low-back pain and increased their acceptance of pain in comparison to individuals who were randomly assigned to participate in the standard care condition. This study also found that individuals continued to meditate months after the program ended, which suggests that participants found benefits and continue to experience these benefits after completing meditation training.

Beasley et al., (2010) furthered the research on chronic pain by focusing on patients with a diverse background and variety of chronic pain conditions who were selected to participate in an 8-week MBSR program. It was found that people with different conditions responded to the meditation intervention differently on scales of psychological and physical well being, such that those with rheumatoid arthritis responded best to the intervention, followed by individuals diagnosed with osteoarthritis, multiple pain conditions, back pain, and fibromyalgia. Though as a whole, participants who completed the meditation intervention reported a reduction of physical pain and psychological symptoms associated with pain such as anxiety, stress and depression, and improvements in health-related quality of life. This finding highlights the opportunity to investigate condition-specific interventions to reduce chronic pain.

Previous research has highlighted the many benefits of meditation as a treatment of chronic pain, yet meditation is a broad term that encompasses many practices other than MBSR (the predominant model of meditation in research). Carson et al., (2005) provided loving-kindness meditation interventions for participants with chronic low back pain who also had a history of anger and resentment. Researchers believed that psychological distress and emotions such as anger and resentment exacerbate pain symptoms. After the meditation intervention, participants reported lower levels of pain and less psychological distress in comparison to their standard care counterparts who did not receive the meditation intervention. A direct relationship was also established among the amount of time spent meditating and positive outcome measures such as reduced pain and psychological distress.

Goals and Hypothesis of the Specific Study

Reviews of previous research have shown a tendency to recruit participants of relatively similar background, with an emphasis on age homogeneity (Carson et al., 2005, Morone & Greco, 2007 & Morone, Greco & Weiner, 2008) As mentioned above, our minds and bodies appraise pain differently throughout the

lifespan (Gibson, Helme, Horne & Yong, 2001 & Galigese & Melzack, 2003). With the understanding that the body of an older adult and a younger adult may react differently to pain, this may lend greater potential in finding age-specific treatment options for chronic pain conditions. For example, in a review of mind-body intervention programs offered to older adults, Greco and Morone (2007) found that optimal pain relief and functionality was achieved by offering age-specific meditation interventions. More specifically, older adults received the most benefits from movement-based interventions such as yoga or tai chi. While mindfulness meditation can be used in a variety of contexts, this intervention encourages minimal physical engagement. Instead, the focus is on attaining a non-judgmental state with limited bodily movements. For this reason, the current study is expected to decrease the perception of pain in both older adults and college students but will have greater effects on college students.

This study will be looking at the relationship between the perception of pain and meditation. The hypotheses of this study are:

Primary Hypothesis. The meditation intervention will elicit a greater effect on the perception of pain in comparison to those enrolled in an education control group, with the greatest improvements observed in college students versus older adults.

Secondary Hypothesis. The meditation intervention will have a greater effect on levels distress, marked by decreases in overall decreases in depression, anxiety and stress in comparison to those enrolled in an education control group with the greatest improvements observed in college students.

This study will focus on a heterogeneous population to examine the effects of meditation across age. This study will build upon gaps in previous research by comparing the effects of a meditation intervention on older adults versus college students. The comparison may lend knowledge to tailor age-specific programs for individuals throughout their lifespan.

Methods

Participants

Participants of this study were selected from two populations, older adults and college students. A total of 56 individuals were deemed eligible to participate in this study, of which 31 individuals completed this study. 13 participants were recruited from a senior center where the age of participants ranged from 62-83 years, average age being 73 years old (SD=5.76) . The remaining 18 participants were recruited from a university where the age of participants ranged from 19-47 years old and the average age of students was 24 years old (SD=6.60). Of the total sample, 32% of the participants were male and 68% of the participants were

female. 77% of participants identified as Caucasian, 13% as African American, 7% as Asian and 3% as Other. The average income of participants from the senior center was $43,635 (SD=3,8395.16) and among college students income averaged $12,437 (SD = 17,108.16). Participants reported having the following pain conditions: osteoarthritis (n=4), multiple pain conditions (n=3), chronic low back pain (n=7), rheumatoid arthritis (n=1), headaches (n=6), other, unspecified (n=7). The inclusion criterion for this study was that an individual must have a chronic pain condition that is defined as having pain most days of the week for at least three months.

Recruitment

This study was approved by the institutional review board at the university at which the study was conducted, prior to commencing recruitment procedures. For participants recruited from the senior center, flyers were posted around the center and a recruitment station was set up for interested members to gain general information about the study and to sign up if desired. For participants recruited from the university, research methods professors were contacted to recruit interested students. A sign-up sheet was also sent via e-mail to professors in the psychology department in which they were asked to inform their students. For both parties, a pre-screen measure was included to ensure participants met the criteria required for this study. Those individuals who decided to participate in this study were provided with an informed consent.

Measures

This study used three surveys to assess individuals' mental, physical and emotional states. The DASS-21 (Lovibond & Lovibond, 1995) is made up of three subscales that measure Depression, Anxiety and Stress. The DASS is a likert scale comprised of twenty one questions with each subscale having seven questions. Answers to this measurement fall on a scale ranging from 0-3 (0-did not apply to me at all, 1-applied to me some degree of the time, 2-applied to me a considerable degree or good part of the time, 3- applied to me very much or most of the time). Sample questions from the depression sub-scale include: "I found it difficult to work up the initiative to do things", "I felt that life was meaningless" and "I couldn't seem to experience any positive feelings at all". Sample questions from the anxiety sub-scale include: "I was worried about situations in which I might panic and make a fool of myself", "I experienced breathing difficulty" and "I felt scared without any good reason". From the stress sub-scale, sample questions include: "I found it hard to wind down", "I tended to over-react to situations" and "I was intolerant to anything that kept me from getting on with what I was doing".

The internal consistency reliability of the DASS-21 was studied by calculating Cronbach's α. Each sub-scale yielded these results: depression =.94, anxiety = .87, stress = .91 (Antony, Beiling, Cox, Enns & Swinson, 1998). In terms of construct validity, the DASS Anxiety sub-scale correlated most highly with the Beck Anxiety Inventory (.85), the depression sub-scale correlated most highly with the Beck Depression Inventory (.79) and the stress sub-scale correlated most highly with the Beck Anxiety Inventory (.70). These data suggest that the anxiety and depression sub-scales are valid measures demonstrated by their high correlations and that the stress sub-scale, while still a valid measure of stress, may be similarly representing characteristics of anxiety (Antony et al., 1998). For the purposes of this study, an overall distress score was analyzed by taking a composite score across the three subscales. This overall scale was highly internally consistent in this study, yielding an overall alpha score of .948.

The second measure used in this study was the McGill Pain Questionnaire Short-Form (MPQ- SF) (Melzack, 1987). The Pain Questionnaire is composed of three sub-scales. The first sub-scale is the Pain Rating Index (PRI) which measures the type of pain that is felt. This rating system distinguishes between sensory pain (throbbing, shooting, aching or, tender pain) and affective pain (fearful, sickening, tiring-exhausting pain) and measures the intensity to which the pain is felt on a scale of 0-3 (0-none, 1-mild, 2-moderate, 3-severe). The second sub-scale is the Present Pain intensity (PPI) which instructs participants to mark the amount of pain they feel presently along a scale ranging from "no pain-worst possible pain." The third sub-scale evaluates an individual's overall pain experience on a scale of 0-5 (0-no pain, 1-mild, 2-discomforting, 3-distressing, 4-horrible, 5-excruciating). Internal consistency of the MPQ ranges from .89-.90. The MPQ-SF was shown to be an internally consistent measure of pain in the current study, and is supported by an internal consistency score of .934. The short-form version of the pain questionnaire correlates strongly with the original measure (r =.67-.90). These correlations support the notion that the MPQ-SF is a valid measure of pain (Cleland & Kahl, 2005).

Lastly, the Pain Catastrophizing Scale (PCS) (Sullivan, 1995) is a 13-item scale that measures catastrophic thinking about pain on three subscales: rumination, magnification and helplessness. Sample questions from the rumination scale include: "I anxiously want the pain to go away", "I can't seem to keep it out of my mind" and "I keep thinking about how much it hurts". Sample questions from the magnification scale include: "I become afraid that the pain will get worse", "I keep thinking of other painful events" and "I wonder whether something serious may happen". Sample items from the helplessness scale include: "I feel I can't go on", "It's terrible and I think it's never going to get any better" and "There's nothing I can do to reduce the intensity of the pain". The PCS asks participants to rank (on a 5-point likert scale) the degree to which they

experienced each of the 13 thoughts or feelings when they are in pain. The scale is ranked as follows: 0-not at all, 1-to a slight degree, 2-to a moderate degree, 3-to a great degree, 4-all the time.

Internal consistency of the PCS was determined by calculating Cronbach's α for each subscale: rumination=.87, magnification=.66 and helplessness= .87 with an overall alpha score of .87 (Sullivan, 1995). Alpha for the overall score in the current study was .946, supporting the notion that the PCS is an internally consistent tool to measure catastrophizing thoughts and feelings towards pain. The PCS correlated highly with the FPQ (Fear of Pain Questionnaire) r = .80 (Bishop & Sullivan, 1995). Results of the PCS compared to measures of pain intensity yielded r = .46. This data shows that the PCS is highly correlated with measures of catastrophizing or fear-provoking thoughts about pain and moderately correlated with an individual's actual experience of pain (Bishop & Sullivan, 1995). For the purposes of this study, an overall catastrophizing score was measured by analyzing the composite score across the three subscales.

Procedures

This study was conducted to examine the relationship between perceived pain and the effects of a meditation intervention. Prior to participant sign-up, the date to which each intervention (the education control, or meditation) would correspond was determined by the researcher. Individuals were provided general information of what their participation would entail, such as their one-time, one-hour time commitment to learn coping methods for pain as well as how lifestyles impact their conditions. From there, participants were given the option to sign up for the day on which they wished to participate in the study, blinded to the knowledge of which day corresponded with the two interventions. This method was used to randomly assign individuals to either a control group who received a pain management lecture session or an experimental group who received the meditation training. For both interventions, participants engaged in a single, long session. The control group was presented with information on topics related to chronic pain and individuals were encouraged to share their own experiences on living with a chronic disease. The experimental intervention consisted of an audio-recorded meditation training, the body scan, in which individuals were guided through a focused exercise that asked them to turn their attention inward as they spanned across their bodies. During this intervention the instructor periodically encouraged muscle contraction and release, and a focus on deep, diaphragmatic breathing to aid in eliciting a relaxation response, exercises which are all components of typical MBSR programs (Chiesa & Serretti, 2011). On the day of the intervention, consent forms were reviewed and baseline measurements of demographics, DASS, MPQ-SF and PCS were administered at the beginning of the session. For baseline surveys, participants were encouraged to respond

according to how they felt over the past week. Immediately after the intervention, post-intervention DASS, MPQ-SF, and PCS surveys were collected and participants were encouraged to base their responses on how they felt in that moment.

Analytic Strategy

Following data collection, a three-way mixed analysis of variance (ANOVA) was used to analyze the effects of age (college student vs. older adult) and condition (meditation vs. education) as the between subject factors and time (pre- vs. intervention) as a within-subject factor on the outcomes of pain intensity, sensory-affective ratings of pain, pain catastrophizing and overall distress. Results of a hoc power analysis revealed that the statistical power for the current study was .41 for a moderate effect size. This indicates that the current study was not adequately powered to detect statistical differences in perceptual aspects of pain. Due to the exploratory nature of the project and small sample size which hindered the power of the study, we consider results statistically significant with a p-value of .10 or less.

Results

Sample Characteristics

56 Participants were recruited from both the university and the senior center, 31 of which completed the study. 22 of individuals who did not complete the study had initially shown interest in participating, yet were not present on the day of the intervention due to scheduling conflicts or illness. The remaining three individuals recruited from the senior center were not eligible to participate in the study due to cognitive impairments. Of the 27 participants recruited from the senior center, 13 completed the research study, eight of which were randomly assigned to the education control group while five were assigned to the meditation intervention group. The average time of present symptoms reported was six years (SD =3.65). The remaining 29 participants were recruited from a university. Eleven participants were not present for the date of the study due to scheduling conflicts; the remaining 18 college students completed the study. College students, on average reported pain symptoms for three years (SD =2.6). Eight students were assigned to the education intervention while ten were assigned to the meditation intervention. Sixty-five percent of the total participants had previous experience with meditation (we did not request information regarding how much exposure participants had experienced to meditation). Previous experience with meditation did not significantly affect any of the results presented below. Data collection was administered on the day of the intervention. Therefore

this restricted access to information on those individuals who had initially shown interest in participating, however, were not present for the intervention.

Perceptual Aspects of Pain

Prior to the intervention, college students reported significantly greater levels of sensory affective pain, [t (29) = -1.987, p = .056], pain catastrophizing [t (29) = -1.848, p = .075], and overall distress [t (29) = -2.275, p = .031], in comparison to older adults. College students and older adults did not differ on ratings of pain intensity at baseline [t (28) = -1.288, p = .208]. Tables 1 and 2 present the mean outcome ratings, pre- and intervention among both older adults and college students where positive values indicate a decrease in symptoms from pre to post intervention. Table 3 presents the main and interaction effects found in the study.

A main effect for age was found for overall distress ratings where college students reported significantly greater amounts of distress in comparison to older adults. The remaining outcome variables of pain intensity, sensory affective pain and pain catastrophizing, did not yield significant differences between age groups.

Pain intensity ratings yielded significant main effects for time and condition, showing that individuals in the meditation condition reported greater mean levels of pain intensity than individuals in the education condition and individuals in both treatment conditions reported significantly less pain intensity following the intervention. Results did not yield significant interaction effects for time, condition and age indicating that individuals, regardless of the intervention they underwent and age, showed similar improvements of mean pain intensity ratings following the intervention.

Pain-catastrophizing ratings yielded a main effect for time, suggesting that participants reported less catastrophic thoughts about pain following the intervention. The interaction effect between time and condition was not significant for pain catastrophizing, suggesting that both groups experienced similar levels of reduction in catastrophizing symptoms over time. An interaction effect between time and age was found, indicating that college students responded significantly better to either intervention than older adults. Results did not yield further interaction effects for pain catastrophizing, which suggests that while the interventions offered in this study aided in overall improvements of pain catastrophizing, the interventions were unable to establish differential effects for the age groups over time.

Overall distress scores on the DASS showed a main effect for time and age suggesting that individuals of both age groups reported less distress following the intervention and college students reported significantly greater amounts of distress in comparison to older adults. Results did not yield significant differences on mean distress scores in relation to condition. Supporting the primary hypothesis of this study, a significant interaction effect was established between

condition and time, indicating that individuals in the meditation condition reported significantly greater decreases in overall distress following the intervention than those in the education condition. The remaining variables did not yield significant interaction effects, signifying similar decreases of distress among age groups following both interventions.

Discussion

As stated earlier, pain can affect our perceptions and vice versa. Our interpretation of the environment and sensory information may act as a lens in which we see the world. This is significant in understanding perceptual aspects of pain, for a contributing component of the pain response may be based within the brain. This system is highly dependent on psychological factors including affect, attention, awareness, emotional state, expectations and changes in consciousness that can influence the perception of pain as well as physiological changes (Preece, Rees, Schütze, M. & Schütze, R., 2010 & UCSF, 2007). This research points towards the potential self-regulatory model of pain perception, stating that changes in our mental states can influence and possibly reduce negative emotions towards pain as well as the perceived intensity of the pain (Bushnell & Villemure, 2002). For this reason the MPQ-SF, PCS and DASS were employed in this study to measure the perceptual aspects of pain.

While the results of this study found moderate to large effect sizes, many of our analyses were not statistically significant due to a relatively small sample size. Reported levels of pain intensity decreased similarly among both age and treatment groups from pre to post intervention. These findings, in conjunction with similar appraisals of pain at baseline between the age groups support Galigese & Melzack's (2003) research, that the evaluation of pain remains constant throughout the lifespan.

If pain is presumably rooted in the brain, it is possible that thoughts and feelings change how much pain is felt (Preece, Rees, Schütze, M. & Schütze, R., 2010 & UCSF, 2007). With this in mind, the effects of treatment from both a meditation and educational standpoint could have elicited participants to perceive a notable decrease in symptomology and become more tolerant of their situation after being given tools that could offer them relief.

Sensory and affective dimensions of pain yielded significant decreases over time across both age and treatment conditions. It is believed that the same occurrence mentioned above can account for this trend. The current study was able to reinforce Beasley et al.'s, (2010) previous findings in the field of mind-body interventions as a treatment option for reducing the intensity of chronic pain presented by the moderate to large effect sizes reported in these dimensions of pain perception. Higher baseline evaluations of sensory-affective pain among college students in comparison to older adults converged with Gibson, Helme,

Horne & Yong (2001)'s findings and possibly offer support for the hypothesis that pain becomes normalized with advancing age. These findings reinforce the need for further research into management, interventions and understanding of the differences in pain appraisals across the lifespan.

Reported levels of catastrophic thinking also showed improvement post-intervention across both age and treatment conditions. Results from this study converged with Kabat-Zinn's (1982) study on an 8-week MBSR program that reduced catastrophic thinking; however results of the current study were unable to establish that the meditation intervention elicited greater results than the education condition. It is possible that with a calmer emotional state and less pain felt that individuals actually perceived their pain as less threatening, long-lasting or as having a less significant impact on their life. The meditation as well as the education intervention may have promoted a deeper sense of self-awareness and detachment from judgment which again may have contributed to the decrease in catastrophic thoughts.

Main effects signifying decreases in overall distress levels were observed for time and age. As stated above, tools that offer individuals relief from pain and promote self reliance such as meditation and knowledge may have aided in decreases in distress over time. The heightened baseline appraisals of distress among college students diverge with Galigese & Melzack's (2003) & Gibson, Helme, Horne & Yong (2001) conclusions. These results may parallel results of sensory-affective pain ratings, such that older adults may attribute pain-related symptomology to "normal" signs of aging and may have a decreased sense of hope in finding relief for their conditions. Another hypothesis supporting these results is that college students find their pain to be premature for their stage in life, a reaction opposite to the normalization of pain of which older adults may engage. This experience of pain may perpetuate catastrophic and distressing thoughts for younger adults. Further explanations of these specific issues are stated as a limitation of the study in relation to sample size and recruitment procedures.

The significant interaction effect found between time and condition help to establish the effectiveness of meditation in reducing psychological symptoms of pain. These results support Beasley et al.'s, (2010) conclusions which proposed an 8-week MBSR would reduce levels of distress across a variety of pain conditions. When in pain, individuals usually feel strong, discomforting emotions which are often learned or desired to be avoided (Preece, Rees, Schütze, M. & Schütze, R., 2010). Yet meditation in its nature cultivates non-judgment and promotion of acceptance towards a current state. Individuals in the experimental arm may have gained awareness in their ability to welcome a broad range of feelings while keeping a grounded sense of self during the meditation exercise, an opportunity that may have previously seemed unattainable. Yet with practice offers great

healing potential. By keeping the mind less reactive, individuals may actually decrease their resistance towards negatively labeled emotions such as fear, sadness, and fatigue and therefore feel less bothered by their emotional states.

The findings stated above offer support to further the efforts of finding a more descriptive definition of pain as well as the investigation of age-specific interventions for chronic pain in the field of mind-body medicine. The current research study was able build upon previous research that has implemented meditation for the treatment of chronic pain. For example, this study was able to show an immediate change in symptoms from pre to post intervention, a finding many studies have not focused on. When in pain it is understandable for an individual to seek immediate relief, the findings from this study then indicate an additional appeal of meditation and may promote long-term usage if immediate effects were on an individuals' radar. Lastly, this study was able to compare the effects of a meditation intervention across two age groups, which has not warranted focus in previous studies.

Limitations

Limitations of the current study include sample size, researcher and self-reporting bias, a clear representation of pain, and the nature of the meditation intervention. The small sample size reduced the power of this study and therefore contributed to the statistical insignificance of the outcome measures. The limited number of participants may have also lead to a moderate amount of variance observed within the groups in reports of pain intensity. Although participants chose the group to participate in, the time slots offered to participants to be involved in this study was very limited, to the span of two days. This limited the amount of people who could initially volunteer to participate and posed as a difficulty when scheduling around pre-planned activities of the senior center. The small sample size and limited time frame may have limited the randomization of the participants and the significance of the results found in the present study.

Also, attempts to include a pre-screen measure to ensure a chronic pain condition may need tailoring as some participant's self-reports did not reflect a diagnosis or presence of any pain-related symptoms. While self-reported measures inherently carry a bias, this may have accounted for an under-reporting of sensitive subjects such as distress and catastrophic thoughts. Additionally, a potential researcher bias may have presented itself in the current study. The researcher may have contributed to a lack of randomization when recruiting participants because they held knowledge of the predetermined date which corresponded with each intervention. For this reason, it is possible the researcher may have been influential in the participants' decision of which day to attend the intervention when present for recruitment processes. In future trials, a partial

blinding may be useful to employ for researchers to attempt to mitigate researcher bias and in turn create a more truly randomized sample.

Lastly, the single meditation intervention was able to provide introductory results in the realm of mind-body treatments for chronic pain, although a more encompassing intervention would have been preferred. Many studies have investigated the effects of an 8-week mindfulness based stress reduction (MBSR) program in which participants commit to meditative practices several hours of the day most days of the week (Greco, Morone, & Weiner 2007 Beasley et al., 2010, Kabat-Zinn, 1982). It should be noted as well that these larger scale studies have yielded significant results in regards to the efficacy of MBSR as a treatment of chronic pain. Due to time constraints and perceived willingness of participant involvement, this study chose to focus on a single meditation intervention and its effects on the perception of pain. A longer, more comprehensive intervention should be considered when investigating the effects of MBSR for chronic pain condition.

Research suggests that chronic pain is a complex and engrained perceptual experience that requires extensive treatment to unwire learned reactions to pain (UCSF, 2007, Bushnell & Villemure, 2002 & Preece, Rees, Schütze, M. & Schütze, R., 2010). For these reasons, the use of a multidimensional treatment model such as an 8-week MBSR intervention may effectively target a broader range of pain symptomology and will offer ongoing support to match the persistence of such pain conditions that the participants in the present study have endured.

Future Implications

Considerations for future directions of this study include: an expansion of meditation interventions offered to participants and an extended duration of the study. Widely used models of mindfulness interventions in treatment studies often employ techniques to target the mind, using Cognitive-Behavioral Therapy (CBT), the body, using movement therapies and the spirit, using mindfulness and meditation exercises. Expansions upon the current and past studies of meditation interventions would employ a design that incorporates exercises to target the three aforementioned realms of an individual. There is also interest in expanding upon traditional mind-body interventions for pain such as guided imagery to stimulate the use of our senses, possibly adding a layer of "distraction" from pain in an effort to reduce pain and movement-based therapies such as tai-chi or yoga that have been mentioned in previous studies to help alleviate pain symptoms (Bushnell & Villemure, 2002, Greco & Morone, 2007). Traditional 8-week MBSR programs may yield greater effects on pain perceptions because they teach individuals to develop the practice of inner-focused awareness. Societal norms often teach us to surround ourselves with stimulation and reward individuals who

take on large responsibilities. These norms may be contributing to the stress and anxiety many can relate to, and since these practices are somewhat engrained within our cultural context, individuals may have had trouble adjusting to a period of stillness and silence. Over time, and with cultivation of mindfulness practices, individuals may learn to appreciate and achieve inner stillness in the midst of a busy lifestyle.

Also, because prevention is an emerging theme that is seen in healthcare, the meditation practices may help to slow the progression, and decrease the intensity of the pain which may therefore cause co-existing conditions such as anxiety, stress and depression to reduce or even subside. To increase efficacy of pain relief, our focus shifts to alternative methods such as meditation for pain relief because pain medications do not offer relief to everyone. As the baby boomer generation ages, they will be looking for alternative ways to cope with the physical and psychological conditions they may be facing. Meditation can offer a cost effective treatment option for the influx of needs this country will be facing in the future. As elders become more integrated into our society, we will need to meet the needs of their concerns such as chronic pain, which is not a normal part of aging, but is found in as many as fifty percent of older adults living in communal settings (Greco & Morone, 2007).

Summary

While only college students show significant decreases in mean scores of overall distress, the data suggests an overall trend in support of the hypothesis, that meditation can affect the perception of pain, more specifically in areas of sensation, intensity and emotional attachment to pain. This study reinforces the notion that meditation may aid in decreasing various symptoms of pain, where improvement in one dimension of pain symptomology may prompt further improvements in other perceptual aspects of pain. The current study broadly covered the perceptual nature of pain and highlighted clinical implications for the use of mind-body therapies to treat pain. While many of the results lacked statistical significance, with the exception of decreases in distress in college students, the considerable effect sizes reinforce the promising results that meditation may hold as a treatment option to reduce perceptual aspects of pain in the absence of a physical manipulation of a pain stimulus.

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Table 1 *Descriptive statistics for the education condition*

Outcome Measures	**Pre intervention**			**Post intervention**		
	Mean	N	SD	Mean	N	SD
Older Adults						
McGill PPI	1.429	7	.98	1.571	*7*	1.40
McGill PRI	.618	8	.55	.492	*8*	.50
PCS	.837	*8*	.68	.731	*8*	.71
DASS	.179	*8*	19	.120	*8*	.11
College Students						
McGill PPI	2.130	*8*	1.46	1.500	*8*	.93
McGill PRI	.917	*8*	.35	550	*8*	.41
PCS	1.365	8	1.00	.904	8	.63
DASS	.679	*8*	.54	.577	*8*	.50

PPI = Present Pain Intensity, PRI = Pain Rating Index, PCS = Pain Catastrophizing Scale, DASS = Depression, Anxiety, Stress Scale

Table 2 *Descriptive statistics for the meditation condition*

Outcome Measures	**Pre intervention**			**Post-intervention**		
	Mean	N	SD	Mean	N	SD
Older Adults						
McGill PPI	2.800	5	1.64	2.300	5	1.48
McGill PRI	.720	5	.35	.413	5	.23
PCS	1.492	5	1.58	1.178	5	1.34
DASS	.556	5	.47	.363	5	.30
College Students						
McGill PPI	3.10	10	1.20	2.200	10	1.48
McGill PRI	1.081	10	.60	.509	10	.37
PCS	2.139	10	.93	1.000	10	.67
DASS	.910	9	.77	.265	9	.21

PPI = Present Pain Intensity, PRI = Pain Rating Index, PCS = Pain Catastrophizing Scale, DASS = Depression, Anxiety, Stress Scale

Table 3 *Results of 3-way Mixed ANOVA examining effects of condition, age, and time on pain symptoms*

Source	Sum of Squares	df	Mean Square	F	p	n2
Between-subjects						
Condition						
McGill PPI	12.548	1	12.548	4.863**	.036	.158
McGill PRI	.020	1	.020	.064	.803	.002
PCS	3.537	1	3.537	2.632	.116	.089
DASS	.259	1	.259	.797	.380	.030
Age						
McGill PPI	.599	1	.599	.232	.634	.009
McGill PRI	.601	1	.601	1.961	.173	.068
PCS	1.244	1	1.244	.926	.344	.033
DASS	1.310	1	1.310	4.032*	.055	.134
Within-subjects						
Time						
McGill PPI	3.119	1	12.548	4.863*	.074	.118
McGill PRI	1.711	1	1.711	16.464**	.0001	.379
PCS	3.709	1	3.709	10.893**	.003	.287
DASS	.888	1	.888	11.356**	.002	.304
Interaction effects						
McGill PPI						
time*condition	.742	1	.742	.827	.371	.118
time*age	1.201	1	1.201	1.339	.258	.049
condition*age	.159	1	.159	.062	.806	.002
time*condition*age	.119	1	.119	.133	.718	.005
McGill PRI						
time*condition	.136	1	.136	1.304	.263	.046
time*age	.233	1	.233	2.241	.146	.077
condition*age	.009	1	.009	.029	.866	.001
time*condition*age	.001	1	.001	.006	.941	.0001
PCS						
time*condition	.712	1	.712	2.092	.160	.072
time*age	1.266	1	1.266	3.718*	.064	.121
condition*age	.050	1	.050	.037	.849	.001
time*condition*age	.200	1	.200	.586	.451	.021
DASS						
time*condition	.412	1	.412	5.260**	.030	.168
time*age	.218	1	.218	2.790	.107	.097
condition*age	.439	1	.439	1.351	.256	.049
time*condition*age	.149	1	.149	1.906	.179	.068

Note: **p. <.05 *p. <.10, PPI= Present Pain Intensity, PRI= Pain Rating Index, PCS = Pain Catastrophizing Scale, DASS = Depression, Anxiety, Stress Scale