

BARRIERS AND FACILITATORS TO YOGA PRACTICE  
IN ADULTS WITH CHRONIC LOW BACK PAIN

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## ABSTRACT

Given the high prevalence of chronic low back pain in the United States and the potential beneficial effects that integrative yoga interventions may have on this condition, the current study sought to examine barriers and facilitators to trying yoga in a population of adults with chronic low back pain. Participants self-reporting chronic low back pain were recruited from community sites in a collegiate town in western Alabama. Primary analyses utilized hierarchical regression and traditional 4-step mediational analyses to examine the predictive influence of catastrophizing and fear of movement on yoga attitudes. Results indicate that fear of movement serves a mediating role between catastrophizing and yoga attitudes. Originally proposed analyses included measurement of “intent to try yoga” as a primary outcome of interest. However, relationships between predictor variables and the unstandardized intent measure were, in general, extremely weak and execution of analyses was not indicated. Measurement of intention is discussed in Appendix A. Participants also responded to items asking them about perceptions of potential barriers and facilitators to trying yoga. Responses were subjected to qualitative thematic analysis and several common themes emerged for both barriers and facilitators: physical issues, cognitive/affective issues, motivational issues, informational issues, practical issues, and social issues. Qualitative analyses are discussed in Appendix B. Identifying cognitive barriers to consideration of yoga as a potential beneficial treatment for chronic low back pain conditions has great importance for clinical treatment of pain, especially as health care focus in the U.S. shifts to be more preventative and emphasizing self-management.

## DEDICATION

This dissertation is dedicated to my parents, Jim and Nancy Combs, who have provided help and guidance over the last twenty-eight years which has allowed me to be where I am and who I am today. Without their support, this would not have been possible.

## LIST OF ABBERRIATIONS AND SYMBOLS

|          |  |
|----------|--|
| $\alpha$ | Cronbach's index of internal consistency   |
| $df$     | Degrees of freedom: number of values free to vary after certain restrictions have been placed on the data  |
| $F$      | Fisher's $F$ ratio: A ratio of two variances   |
| $B$      | Standardized $Beta$ coefficient: how many standard deviations a dependent variable will change per standard deviation increase in a predictor variable |
| $M$      | Mean: the sum of a set of measurements divided by the number of measurements in the set  |
| $p$      | Probability associated with the occurrence under the null hypothesis of a value as extreme or more extreme than the observed value                     |
| $r$      | Pearson product-moment correlation   |
| $t$      | Computed value of a $t$ test   |
| $<$      | Less than  |
| $=$      | Equal to   |

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## **Introduction**

Chronic pain is a significant public health problem in the United States (U.S.), affecting at least 116 million American adults and costing up to \$635 billion each year (Institute of Medicine [IOM], 2011). Chronic low back pain is the second most common cause of disability status in American adults (Brault, Hootman, Helmick, Theis, & Armour, 2009) and is one of the most common reasons that individuals seek consultation from their primary care providers (Macfarlane et al., 2012). Traditional biomedical treatments (e.g., medication and surgery) for chronic low back pain are expensive (with estimated annual costs of \$62.5 billion and \$4.7 billion, respectively; Gatchel & Okifuji, 2006), often do not result in long-term improvement of pain, and pose high risks for significant side effects (Bruckenthal, Reid, & Reisner, 2009; Fitzcharles, Lussier, & Shir, 2010; Gatchel & Okifuji, 2006; Turk, 2002). Therefore it is important to provide treatments that are not only effective, but safe and cost-effective, as well.

A growing body of evidence supports complementary and alternative medicine (CAM) treatments as beneficial. The National Center for Complementary and Alternative Medicine (NCCAM) defines CAM as a compilation of various health care practices, techniques, and products that are typically considered to be outside the traditional medical model (National Center for Complementary and Alternative Medicine [NCCAM], 2011, July). One CAM treatment often studied in the context of chronic low back pain is yoga. As defined by NCCAM, yoga is a mind-body practice that combines breathing, physical movements, and meditation or

relaxation techniques to benefit health and well-being(National Center for Complementary and Alternative Medicine [NCCAM], 2012, May 29). Early empirical evidence suggests that yoga is feasible and efficacious for treating chronic low back pain in adults (Galantino et al., 2004; Groessl, Weingart, Aschbacher, Pada, &Baxi, 2008; Kelly, 2009; Tekur, Singphow, Nagendra, &Raghuram, 2008; Tilbrook et al., 2011). Outcomes included decreased perceived pain (Groessl et al., 2008), decreased pain-related disability, improved balance, flexibility, and back function (Galantino et al., 2004; Tekur et al., 2008; Tilbrook et al., 2011), and improved pain self-efficacy (Tilbrook et al., 2011). Recent systematic reviews of RCTs using various types of yoga as an intervention for chronic pain conditions suggested that, overall, yoga results in significant reductions in pain and functional disability when compared to a variety of control conditions(Holtzman&Beggs, 2013; Posadzki, Ernst, Terry, & Lee, 2011). Although research has examined various styles of yoga, most researched yoga interventions for chronic low back pain adapt poses in an effort to protect participants' safety and prevent injury. This is a distinctive characteristic of yoga, in that it is implemented in such a manner as to proactively prevent injury and protect specific weak or injured areas of the body, if presented by a competent and informed instructor.

Given this evidence for yoga's potential benefits, low level of risk, and low cost, it is important to assess the barriers and facilitators to consideration of a yoga intervention as a viable integrative treatment for chronic low back pain. Although some research has focused on the benefits, barriers, and cues to action of yoga in general(Atkinson &Permuth-Levine, 2009),the examination of factors influencing attitudes toward yoga in a population of individuals with

chronic low back pain is a step that has been neglected thus far in fields of pain and yoga research.

Yoga participation in the U.S. has increased in recent years (up from 5.1% of the population in 2002 to 6.1% in 2007; Barnes, Bloom, & Nahin, 2008) and researchers estimate that approximately 16 million Americans currently practice yoga (Quilty, Saper, Goldstein, & Khalsa, 2013). Yet, there still exist many misconceptions about what yoga is, how it is practiced, and the various ways it can be beneficial. Commonly cited barriers to practicing yoga include time (e.g., long duration of class), cost (e.g., buying own equipment), perceived difficulty or inappropriateness for people with certain physical conditions (e.g., frail or elderly patients), and other negative pre-existing conceptions (e.g., lack of aerobic challenge; Atkinson & Permut-Levine, 2009). Attitudes towards yoga are likely to affect an individual's willingness to consider it as a beneficial treatment for chronic low back pain.

Although not previously linked to attitudes toward yoga, pain catastrophizing (CAT) and fear of movement (FOM) have been two well-researched constructs in the chronic pain literature. Pain catastrophizing has been defined as an exaggerated negative mental set about real or anticipated pain and is often considered a precursor to pain-related fear of movement (Vlaeyen & Linton, 2000). Fear of movement is conceptualized as an affective state that leads to an individual's engagement in protective behaviors in an effort to avoid pain (Vlaeyen & Linton, 2000). Research has demonstrated that CAT and FOM lead to avoidance behaviors (e.g., limiting physical activity) and suggest that these concepts may be primary contributors to the development of chronic pain (Vlaeyen & Linton, 2000). Previous research has shown that fear-avoidance beliefs (e.g., a patient's beliefs about how certain activities may affect his or her pain) in individuals who experience chronic pain are linked to increased pain-related disability and

worse overall physical health, even when other variables, such as demographics, pain intensity, and pain duration were statistically controlled (Sions & Hicks, 2011).

Vlaeyen and colleagues (2002) posit that FOM is one of the most relevant predictors of a variety of physical performance measures in patients with chronic pain, and FOM, along with CAT, appears to be a positive predictor of chronic pain in adults (Vlaeyen, de Jong, Geilen, Heuts, & van Breukelen, 2002). Previous studies have also linked pain catastrophizing with pain intensity and disability (Cross, McConley, & Thorn, 2009; Meyer, Tschopp, Sprott, & Mannion, 2009; Thorn et al., 2007). The most common relationships between CAT, FOM, and pain outcomes are further explained in Vlaeyen's conceptual fear-avoidance model for pain. The model posits that, in the presence of pain, catastrophizing about pain leads to increases in pain-related fear of movement, which leads to avoidance behaviors (disengagement from activity) and ultimately a higher level of overall disability (Vlaeyen & Linton, 2000).

Given the available evidence for the significant ways in which CAT and FOM may affect daily functioning and long-term outcomes in chronic pain, it is important to consider how these cognitive constructs may interfere with treatment of these individuals. Both CAT and FOM have been suggested as important factors to consider during pain treatment planning and pain prevention (Picavet, Vlaeyen, & Schouten, 2002), especially given that high levels of either may interfere with willingness to consider a movement therapy as a treatment for chronic pain. As previously discussed, yoga is one movement therapy that has been demonstrated as beneficial in the treatment of chronic low back pain and it is likely that one's attitudes toward yoga will predict willingness to engage in it. If CAT and FOM tend to lead to avoidance behaviors, as described in the fear-avoidance model, it is possible that these cognitive constructs also predict attitudes toward yoga. Specifically, in individuals high in CAT and FOM, yoga may be viewed

as an activity with potential to cause pain and these individuals may choose to avoid yoga due to perceived threat of pain, regardless of information indicating its likelihood to be beneficial.

Essentially, attitudes toward yoga may serve as an outcome similar to avoidance behaviors in the fear-avoidance model. The utilization of Vlaeyen's fear-avoidance model (Vlaeyen & Linton, 2000) to inform our conceptual model provides an innovative approach to conceptualizing influences on behavior in integrative pain treatment that links together previously independent areas of research. In this case, linking yoga with psychosocial factors often associated with limited activity in chronic pain is unique and offers a new perspective on each of these areas.

It was hypothesized that higher levels of FOM and CAT would negatively predict an individual's attitudes toward yoga. In addition, it was hypothesized that FOM would mediate the pathway between CAT and yoga attitudes. If one can determine the factors that influence negative (or positive) biases regarding considering yoga as a possible treatment, this may contribute to the promotion of a larger number of adults engaging in an alternative, efficacious, and low-risk treatment for chronic pain.

## Methods

### Participants

A sample of 102 community participants from a collegiate town in western Alabama self-reporting with chronic low back pain (pain resulting from an injury or condition that is significant and has lasted at least six months) were recruited to participate in the study via publicly distributed flyers, announcements in local newsletters, and in-person recruitment at a number of community sites. An incentive of \$10 was paid to participants for completion of the entire study. The sample spanned ages 19 to 84 (Mean age = 50.5) and was limited to participants who were able to communicate in English and who were not reporting acute pain (defined as temporary pain resulting from a specific injury) as a primary pain source. There were no exclusions based on sex or ethnicity. Approximately 58% of the sample had never practiced yoga before at the time of study completion. See Table 1 for general descriptives of the sample.

### Measures

**Semi-structured Interview.** Participants were asked to provide information on their age, sex, ethnicity, marital status, and level of education as part of the interview. Participants were also asked to provide information about their pain history (including duration of pain in months and pain intensity over the last week) and attitudes towards yoga. The majority of information included in the interview was used for descriptive purposes, aiding in describing general

participant characteristics as well as in gathering qualitative information related to participants' attitudes toward yoga.

**Beliefs About Yoga Scale.**The Beliefs About Yoga Scale (BAYS; Sohl, Schnur, Daly, Suslov, & Montgomery, 2011) was used to measure individual attitudes towards yoga. The BAYS consists of 11 items loading on three main factors: expected health benefits (e.g., "I would sleep better."), expected discomfort (e.g., "I would be embarrassed in a class."), and expected social norms (e.g., "There would only be women in a class."). Items are rated on a Likert scale ranging from 1 to 7 (1 = extremely unlikely, 7 = extremely likely) and assess the strength of individual beliefs about yoga outcomes, such that a higher score on the BAYS indicates more positive beliefs about yoga. The BAYS has been validated in a general, non-clinical sample and was shown to have good psychometric properties (Sohl et al., 2011).

For the purposes of the current study, three items removed during scale development were re-added (with some re-wording) in an exploratory fashion due to their specific relevance to chronic pain. In addition, one additional item was also administered, assessing an individual's beliefs about yoga's potential to exacerbate or alleviate a physical pain condition. Internal consistency for the modified version of the BAYS used in this sample was satisfactory (Cronbach's alpha = .84).

**The Tampa Scale of Kinesiophobia.**Fear of movement was measured using the Tampa Scale for Kinesiophobia (TSK; Miller, Kopri, & Todd, 1991). The TSK consists of 17 items with a 4-point scale range (1 = strongly disagree, 4 = strongly agree). Items assess an individual's fear of movement as it might relate to (re)injury (e.g., "I'm afraid that I might injure myself if I exercise."). A total score is derived from addition of the 17 items, four of which are reverse

scored. The TSK has been used extensively with adults and has been shown to have satisfactory reliability and validity (Lundberg, Styf, & Carlsson, 2004; Swinkels-Meewisse, Swinkels, Verbeek, Vlaeyen, & Oostendorp, 2003). In the current sample, reliability was also satisfactory (Cronbach's alpha = .76).

**Pain Catastrophizing Scale.** The Pain Catastrophizing Scale (PCS; Sullivan, Bishop, & Pivik, 1995) was used to assess negative thought patterns about pain. The PCS consists of 13 items regarding the frequency with which they have certain thoughts and feelings while experiencing pain (e.g., "I worry all the time about whether the pain will end."). Respondents are asked to provide an answer on a 5-point scale (0 = not at all, 4 = all the time). Scores for each item are summed for a total score. A higher total score on the PCS is indicative of higher frequency of catastrophic thoughts about pain. The PCS has been used extensively in pain research and has been shown to have good psychometric properties (Osman et al., 1997; Sullivan et al., 1995). Similarly, in the current sample internal consistency was found to be quite strong (Cronbach's alpha = .95).

## **Procedure**

Participants were either recruited on-site at one of the participating community locations or saw a flyer and scheduled an appointment via phone or e-mail. All participants completed the study in person with a researcher associated with the University of Alabama Pain Research Lab. After giving informed consent participants completed three quantitative questionnaires assessing specific constructs: beliefs about yoga, fear of movement, pain catastrophizing. A semi-structured in-person interview was then conducted with each participant. At the completion of the interview session, participants were compensated \$10 for their time and effort in completing

measures and responding to interview questions. All procedures were approved by the University of Alabama Institutional Review Board.

## Results

Preliminary analyses identified descriptive characteristics of the current sample and examined potential influences of age, sex, ethnicity, and education on primary variables: CAT, as measured by PCS scores, FOM, as measured by TSK scores, and attitudes toward yoga, as measured by BAYS scores. A Pearson correlation coefficient was computed to assess the relationship between age and scores on the PCS, TSK, and BAYS but showed no significant correlation between age and PCS scores ( $r(99) = -.19, p = .05$ ), age and TSK scores ( $r(97) = .03, p = .80$ ), or age and BAYS scores ( $r(98) = -.16, p = .11$ ). Independent samples t-tests were conducted to determine if there were any differences in PCS, TSK, or BAYS scores based on sex. Results indicated that there were no significant differences in PCS ( $t(99) = -1.26, p = .21$ ), TSK ( $t(96) = -1.01, p = .32$ ), or BAYS scores ( $t(98) = -1.55, p = .13$ ) based on whether participants were male or female.

Given that the majority of the sample was either non-Hispanic white or non-Hispanic black (only 9% were of other ethnicity), consideration of ethnic differences is centered on these two ethnic groups. Three independent samples t-tests were conducted to examine potential differences in outcome variables based on ethnicity. There was a significant difference in the scores for non-Hispanic whites ( $M = 18.75, SD = 12.47$ ) and non-Hispanic blacks ( $M = 31.48, SD = 14.29$ ) on PCS scores,  $t(89) = -4.39, p < .001$ . There was also a significant difference in the scores for non-Hispanic whites ( $M = 33.93, SD = 6.99$ ) and non-Hispanic blacks ( $M = 40.74,$

$SD = 10.99$ ) on TSK scores,  $t(86) = -3.55, p < .001$ . However, there was no significant difference in BAYS scores based on ethnicity,  $t(88) = 1.56, p = .12$ .

A one-way MANOVA indicated a significant effect of education on the primary variables, Pillai's trace = .40,  $F(12, 270) = 3.45, p < .001$ . Given that the overall test was significant, the univariate main effects were examined. Significant univariate main effects for education were obtained for PCS scores ( $p < .001$ ), TSK scores ( $p < .001$ ), and BAYS scores ( $p < .01$ ). Follow-up Bonferroni post hoc testing indicated that group 1 (less than high school) had significantly higher PCS scores than groups 3 (some college/technical school;  $p < .01$ ), 4 (college degree;  $p < .01$ ), and 5 (greater than college degree;  $p < .001$ ) and group 2 (high school/GED) had significantly higher PCS scores than groups 4 (college degree;  $p < .05$ ) and 5 (greater than college degree;  $p < .01$ ). For TSK scores, group 1 (less than high school) had significantly higher scores than group 4 (college degree;  $p < .05$ ) and group 5 (greater than college degree;  $p < .01$ ). Group 2 (high school/GED) demonstrated significantly higher scores than groups 4 (college degree;  $p < .01$ ) and 5 (greater than college degree;  $p < .01$ ). However, Bonferroni post hoc testing did not reveal any significant effects for education on BAYS scores. See Table 1 for descriptive details of the sample composition on age, sex, ethnicity, and education as assessed in the preliminary analyses and Table 2 for zero-order correlation coefficients among the continuous dependent and independent variables.

Primary analyses included examination of the relationships between primary predictor variables (CAT and FOM) and outcomes (attitudes toward yoga), and more specifically an examination of how these constructs might reflect relationship patterns present in the fear-avoidance model (Vlaeyen & Linton, 2000). Prior to testing the hypothesized mediation model,

the paths between each of the main variables, CAT (PCS scores) and FOM (TSK scores) and yoga attitudes (BAYS scores) were examined individually via two hierarchical regression analyses. For each regression, demographic variables (age, sex, ethnicity, and education) were entered into Block One, while the primary predictor variable (PCS or TSK scores) was entered into Block Two. For the first regression, examining the influence of PCS scores on BAYS scores, each of the two hierarchical steps added statistically significant predictive power (See Table 4). The final model predicted 17% of the variance, with PCS scores adding the final 5.0% of predictive power,  $F(1, 93) = 5.89, p < .05$ . PCS scores ( $\beta = -.27$ ) emerged as a significant negative predictor of BAYS scores ( $p < .05$ ). In the regression examining the relationship between TSK and BAYS scores, each of the hierarchical steps also added statistically significant predictive power (See Table 3). The final model predicted 35.1% of the variance, with TSK scores adding 21% of the overall predictive power,  $F(1, 90) = 31.26, p < .001$ . TSK scores ( $\beta = -.54$ ) were also a significant negative predictor of BAYS scores ( $p < .001$ ). In both regressions, females tended to report more positive attitudes toward yoga as compared with males (sex  $\beta = .19$  and  $.20$  respectively;  $p < .05$ ). Although age emerged as a significant negative predictor ( $\beta = -.21$ ;  $p = .05$ ) of BAYS scores in the regression including PCS scores, it was not a significant predictor in the regression examining the impact of TSK scores ( $\beta = -.22$ ;  $p = .07$ ).

In an effort to confirm the structure of the fear-avoidance model in predicting attitudes toward yoga, the second stage of analysis executed Baron and Kenny's four-step mediational analysis (Baron & Kenny, 1986). In Step 1 of the mediation model, the effect of catastrophizing (PCS scores) on yoga attitudes (BAYS scores), ignoring the mediator, was significant,  $\beta = -.33, t(98) = -3.43, p = .001$ . Step 2 showed that the effect of PCS scores on fear of movement (TSK scores) was also significant,  $\beta = .64, t(96) = 8.12, p < .001$ . In Step 3 of the model, the effect of

TSK scores on BAYS scores was also significant,  $\beta = -.56$ ,  $t(95) = -6.56$ ,  $p < .001$ . Step 4 of the analyses revealed that, controlling for the mediator (TSK scores), PCS scores were no longer significant in predicting BAYS scores,  $\beta = .07$ ,  $t(94) = .60$ ,  $p = .55$ , indicating a complete mediation. A Sobel test for significance (Sobel, 1982) was performed and found confirmation for complete mediation in the model ( $z = -4.98$ ,  $p < .001$ ). When the model was tested in the reverse direction (with CAT as the mediator and FOM as the primary predictor), mediation was not present.

In order to further explore potential differences in CAT and FOM based on ethnicity and education level, exploratory mediation analyses were conducted. Baron and Kenny's four-step mediational analysis (Baron & Kenny, 1986) was utilized. Once again, these analyses were conducted only on non-Hispanic whites and non-Hispanic blacks given that these groups made up the majority of the overall sample. In examining effects on CAT, the total effect of ethnicity on PCS scores ( $\beta = .42$ ,  $t(89) = 4.39$ ,  $p < .001$ ) and the contribution of ethnicity to the mediator, education ( $\beta = -.46$ ,  $t(90) = -4.84$ ,  $p < .001$ ), were both significant. In addition, the effect of education on PCS scores was significant ( $\beta = -.53$ ,  $t(89) = -5.95$ ,  $p < .001$ ). Finally, the effect of ethnicity decreased in significance in predicting PCS scores with the mediator controlled ( $\beta = .23$ ,  $t(88) = 2.30$ ,  $p = .02$ ), suggesting partial mediation. Significance of the mediation was confirmed via a Sobel test for significance ( $z = 3.76$ ,  $p < .001$ ). For the examination of effects on FOM, the total effect of ethnicity on TSK scores ( $\beta = -.36$ ,  $t(86) = 3.55$ ,  $p < .01$ ) and the contribution of ethnicity to the mediator (as noted above) were significant. Additionally, the effect of education on TSK scores was also significant ( $\beta = -.44$ ,  $t(86) = -4.59$ ,  $p < .001$ ). In the final step, controlling for the mediator (education), ethnicity was no longer significant in predicting TSK scores ( $\beta =$

.20,  $t(85) = 1.88, p = .06$ ), suggesting full mediation exists in this relationship. Results of the Sobel test provide confirmation for the significance of the mediation ( $z = 3.34, p < .001$ ).

## Discussion

Overall, results support the hypotheses and indicate that CAT and FOM influence individual attitudes toward yoga, such that a higher level of either cognitive construct corresponds to a more negative attitude toward yoga, and suggest that their influence is substantial even when taking potential demographic differences into consideration. Given that these constructs have been suggested as primary contributors to the development and perpetuation of chronic pain (Vlaeyen & Linton, 2000; Vlaeyen & Linton, 2012), it is not surprising that higher levels of CAT and FOM are linked to negative attitudes toward an activity which might decrease (or benefit the self-management of) chronic pain (Posadzki et al., 2011).

More specifically, it was found that FOM completely mediated the relationship between CAT and attitudes toward yoga. This is consistent with Vlaeyen's fear-avoidance model, which has shown FOM to mediate the relationship between CAT and avoidance behaviors. A growing body of research on this model suggests that pain-related fear is the driving force for protective avoidance behaviors (i.e. limited physical activity) and that catastrophizing is often a primary factor motivating that fear, and not vice versa (Swinkels-Meewisse et al., 2006; Vlaeyen & Linton, 2000; Vlaeyen & Linton, 2012). The current findings support the directionality of Vlaeyen's model in a totally new area and suggest that catastrophic thinking about pain may lead to fear of engaging in physical activity, which then translates into negative attitudes toward yoga.

Extant research has demonstrated that CAT and FOM are primary contributors to chronic pain (Vlaeyen & Linton, 2000) and limited physical movement has been associated with

increased pain-related disability and worse overall physical health (Sions& Hicks, 2011).

Individuals with high levels of CAT and FOM are likely to limit their physical activity and may, as a result, hold negative attitudes toward potential beneficial chronic pain treatments, like yoga, simply because they involve physical movement. The idea that cognitions about pain can influence opinions toward, and likely willingness to try, a potential, low-risk, low-cost treatment is important to consider in clinical settings, especially given the shifting priorities of healthcare intervention in the U.S.

Current average costs of health care utilization per capita in the U.S. are estimated to be over \$8,000 (National Center for Health Statistics, 2013) and these rates are predicted to continue rising if significant changes in health care intervention do not occur. Experts suggest that increasing use of self-managed, integrative, and/or preventative health care methods may combat these costs (Maciosek, Coffield, Flottemesch, Edwards, & Solberg, 2010). Individuals with chronic pain are considered to be among the highest utilizers of medical services in the U.S. with annual back-pain related medication costs estimated to be between \$5,000 and \$10,250 per patient (see review in Gatchel&Okifuji, 2006). If there are specific barriers preventing these individuals from engaging in beneficial behavioral health interventions with the potential to reduce cost of treatment, then these barriers should be considered primary targets for change.

Consistent with the literature, findings also suggest that there is a significant effect of ethnicity on CAT and FOM. Non-Hispanic whites report much lower levels of CAT than Non-Hispanic blacks as well as lower levels of FOM than non-Hispanic blacks in the current sample. Research has demonstrated rates of chronic low back pain to be comparable between whites and blacks (Carey et al., 2010), suggesting differences in levels of CAT and FOM seen here are not

dependent on a higher prevalence of chronic low back pain in one ethnic group than the other. Ethnic differences in CAT have been observed in prior research, with blacks demonstrating higher levels than whites (Chibnall&Tait, 2005), but no previous research has examined these differences in FOM.

Results of the exploratory mediation analyses suggest a partial mediation by education on the relation between ethnicity and CAT and a full mediation on the relation between ethnicity and FOM. Thus, education differences may largely be driving the above relations. In fact, previous research on emergency room patients has suggested that individuals with higher educational attainment score lower on the PCS and tend to report less pain than those with lower levels of education (Platts-Mills et al., 2012). Research looking at education levels as part of an overall socioeconomic status (SES) measure has suggested that low SES is linked to higher levels of FOM in low back pain patients (Valencia, Robinson, & George, 2011). Yet, the impact of education on CAT or FOM is not well-studied. Therefore the illumination of ethnic and educational differences in both of these cognitive components of the pain experience can provide valuable information to clinicians and help to promote culturally-competent care and reduce health disparities in this particular treatment area.

In the current sample, females tended to report more positive attitudes toward yoga than men. Although the preliminary t-test analysis for sex did not indicate that there was a significant effect of sex on the primary variables, hierarchical regression analyses (where sex was included as a control in Block 1) detected a difference for sex on beliefs about yoga. This observed difference is likely, at least partially, accounted for by the fact that yoga is often perceived to be female-dominated in Western culture (Atkinson & Permuth-Levine, 2009). If this is the case, it

may be important to differentially promote yoga as a treatment for chronic low back pain for males and females.

### **Limitations and Future Directions**

The sample was highly educated relative to the general U.S. population (United States Census Bureau, 2012), with approximately 50% having at least a college degree. This is likely related to the fact that recruitment took place in a large university town. However, researchers intentionally chose a broad range of sites in this location (e.g., a university recreation center, a federally qualified health clinic) in an effort to obtain a more generalizable sample. It is estimated that only 28% of individuals in the U.S. have a bachelor's degree or higher (United States Census Bureau, 2012). Therefore, educational attainment in the current sample is greater than in the general population. The ways in which education level may influence exposure to and understanding of various chronic pain interventions is an important relationship to consider in future research, as it may pinpoint a context in which cognitions about pain could be targeted.

Research has demonstrated that hierarchically ordered in-vivo exposure treatment decreased CAT and FOM when compared with graded-activity control groups (Vlaeyen et al., 2002). This provides evidence that exposure to physical therapy movements can lead to beneficial improvements in pain-related cognitions which have the potential to influence individual behaviors. It is quite possible that these effects may also occur via exposure to other movement therapies, such as yoga. Given that yoga is a physical activity with prescribed movements that has been found to have positive effects on chronic pain, (Galantino et al., 2004; Groessl et al., 2008; Kelly, 2009; Posadzki et al., 2011; Tekur et al., 2008) it is surprising that yoga has not yet been conceptualized as a method for exposure in this treatment model. Given that the fear-avoidance model was confirmed in the current study with attitudes toward yoga

servicing as the outcome, one could hypothesize that using yoga as an exposure technique with individuals with chronic low back pain would result in reductions in catastrophizing and fear of movement and more positive attitudes toward yoga. The idea of implementing yoga as an exposure treatment for individuals with high levels of catastrophizing and fear of movement may be an important area for future research.

In the current study CAT and FOM were examined as the principal predictors of attitudes toward yoga. Both of these constructs are likely to affect people's attitudes toward the physical aspects of yoga; however, CAT and FOM may not be capable of capturing the variance in attitudes attributable to the non-physical aspects of yoga. In order to further explore this possibility, basic regression analyses were reviewed to determine the actual amount of variance in BAYS scores captured by CAT and FOM. Without consideration of demographic variables, CAT individually predicted 9.9% of the variance in BAYS (considered a medium effect; Cohen, 1992), while FOM individually predicted 30.7% (considered a large effect; Cohen, 1992). When included together and with demographic variables (i.e., demographics in step 1 and CAT and FOM in step 2), the total variance accounted for in BAYS scores was 34.4%, with CAT and FOM accounting for a combined final 21.5% of variance. This demonstrates that there is important variance unaccounted for by the primary predictor variables in this study. Cultural stereotypes, religious beliefs, general preconceived notions and potential misconceptions are likely to play a role in determining individual attitudes toward yoga and the influence of these variables, while not directly measured in the current study, should be accounted for in future research as important factors in predicting attitudes toward yoga in general as well as in chronic pain populations.

Overall, it appears that CAT and FOM, two constructs well-supported as being influential to the chronic pain experience, are important in predicting individual attitudes toward yoga. Yet, FOM appears to be the driving force, over CAT, in predicting attitudes toward yoga, confirming the directionality of Vlaeyen's fear-avoidance model in this new context. Consideration of the impact of such cognitive components, in general and as they relate to different ethnicities, is essential in treatment planning, especially when these components may serve as barriers to consideration of potentially beneficial treatments for chronic low back pain.

**Table 1.** Descriptive Statistics (Mean, SD)

|                                  | % of original sample | BAYS Scores   | PCS Scores    | TSK Scores    | Pain Intensity Ratings | Pain Duration (in months) |
|----------------------------------|----------------------|---------------|---------------|---------------|------------------------|---------------------------|
| Overall Sample                   | 100%                 | 72.53 (13.43) | 23.53 (14.81) | 36.80 (9.22)  | 5.85 (2.51)            | 143.58 (165.12)           |
| Males                            | 39.2%                | 69.95 (11.07) | 21.25 (13.40) | 35.64 (7.93)  | 4.93 (2.38)            | 157.50 (181.77)           |
| Females                          | 60.8%                | 74.18 (14.58) | 25.03 (15.59) | 37.56 (9.97)  | 6.45 (2.43)            | 134.60 (154.31)           |
| White, Non-Hispanic              | 58.8%                | 74.66 (13.50) | 18.75 (12.47) | 33.93 (6.99)  | 4.93 (2.06)            | 175.60 (192.72)           |
| Black, Non-Hispanic              | 31.4%                | 70.19 (11.95) | 31.48 (14.29) | 40.74 (10.99) | 7.53 (2.12)            | 103.75 (100.11)           |
| Other Ethnicity                  | 9.8%                 | 72.53 (13.43) | 23.53 (14.81) | 36.80 (9.22)  | 6.00 (3.46)            | 78.90 (104.14)            |
| Less than High School            | 13.7%                | 64.79 (16.19) | 38.57 (9.43)  | 42.93 (8.80)  | 8.14 (2.07)            | 192.27 (51.39)            |
| High School or GED               | 10.8%                | 64.00 (8.66)  | 33.82 (14.25) | 44.82 (5.72)  | 6.18 (2.40)            | 118.55 (91.45)            |
| Some College or Technical School | 28.4%                | 76.07 (16.23) | 23.75 (12.99) | 36.39 (10.22) | 6.76 (2.37)            | 96.59 (91.47)             |
| College Graduate                 | 11.8%                | 72.27 (16.23) | 15.00 (12.94) | 31.82 (10.00) | 5.17 (2.25)            | 152.91 (189.52)           |
| Greater than College Degree      | 35.3%                | 75.47 (10.55) | 17.22 (12.78) | 33.62 (6.11)  | 4.36 (1.91)            | 189.78 (200.72)           |

*Note:* BAYS = Beliefs About Yoga Scale; PCS = Pain Catastrophizing Scale; TSK = Tampa Scale for Kinesiophobia

**Table 2.** Pearson's Correlations Between Independent and Dependent Variables

| Variables | Age  | Education | BAYS   | PCS    | TSK |
|-----------|------|-----------|--------|--------|-----|
| Age       |      |           |        |        |     |
| Education | -.14 |           |        |        |     |
| BAYS      | -.16 | .30**     |        |        |     |
| PCS       | -.19 | -.51**    | -.33** |        |     |
| TSK       | .03  | -.45**    | -.56** | .640** |     |

*Note:* BAYS = Beliefs About Yoga Scale; PCS = Pain Catastrophizing Scale; TSK = Tampa Scale for Kinesiophobia; \* =  $p < .05$ , \*\* =  $p < .01$ .

**Table 3.** Summary of Hierarchical Regressions for CAT and FOM Predicting BAYS scores

| <b>Catastrophizing</b>  | <i>b</i> | $\beta$ | <i>t</i> | <i>p</i> | R <sup>2</sup> | R <sup>2</sup> <sub>Δ</sub> |
|-------------------------|----------|---------|----------|----------|----------------|-----------------------------|
| Block 1:                |          |         |          |          | .13            | --                          |
| Age                     | -.15     | -.19    | -1.99    | .05      |                |                             |
| Sex                     | 4.69     | .17     | 1.81     | .07      |                |                             |
| Ethnicity               | -1.33    | -.15    | -1.48    | .14      |                |                             |
| Education               | 1.86     | .30     | 3.14     | <.01     |                |                             |
| Block 2:                |          |         |          |          | .17            | .05                         |
| PCS Scores              | -.24     | -.27    | -2.43    | .02      |                |                             |
| <b>Fear of Movement</b> | <i>b</i> | $\beta$ | <i>t</i> | <i>p</i> | R <sup>2</sup> | R <sup>2</sup> <sub>Δ</sub> |
| Block 1:                |          |         |          |          | .14            | --                          |
| Age                     | -.17     | -.22    | -2.25    | .03      |                |                             |
| Sex                     | 4.55     | .16     | 1.70     | .09      |                |                             |
| Ethnicity               | -1.40    | -.15    | -1.53    | .13      |                |                             |
| Education               | 1.81     | .29     | 2.97     | <.01     |                |                             |
| Block 2:                |          |         |          |          | .35            | .21                         |
| TSK Scores              | -.80     | -.54    | -5.59    | <.001    |                |                             |

*Note:* PCS = Pain Catastrophizing Scale; TSK = Tampa Scale for Kinesiophobia

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## **Appendix A: Measurement of Intention**

Previous research has examined the efficacy of yoga in treating chronic pain, but no research has examined what predicts an individual's intention to engage in yoga therapy for pain. Originally proposed analyses included measurement of "intent to try yoga" as a primary outcome of interest. Catastrophizing (CAT; measured by scores on the PCS), fear of movement (FOM; measured by scores on the TSK), and yoga attitudes (measured by scores on the BAYS) were conceptualized as the predictors that would influence intention to try yoga for pain treatment. Vlaeyen's fear-avoidance model was consulted in the selection of key hypotheses and predictors of intent to attend a yoga class as a supplemental treatment for chronic pain. It was originally hypothesized that higher levels of FOM and CAT, as well as more negative attitudes towards yoga would negatively predict an individual's intent to try yoga. In addition, it was hypothesized that FOM would partially mediate the pathway between CAT and intent to try yoga and that this pathway would be moderated by attitudes towards yoga.

It is recognized that intention to perform a behavior is not perfectly associated with actual participation in the behavior itself. However, research has demonstrated that merely answering questions about intention is associated with increased consideration of attitudes related to that intention and even potential increases in actual behavior (Morwitz, Johnson, &Schmittlein, 1993). In fact, the theory of planned behavior, a theory often utilized in the prediction of physical activity, posits that intention may, indeed, be the strongest predictor of future behavior (Vallance, Murray, Johnson, &Elavsky, 2011). According to the theory of planned behavior, intention to engage in a behavior is strengthened by the belief that the behavior is beneficial (attitude), the belief that others will approve of the behavior (subjective norm), and the belief that one is capable of engaging in the behavior (perceived behavioral control; Vallance et al., 2011).

This conceptualization of intention is relevant to the current study, specifically, given that attitudes were a primary chosen predictor of intent.

In the current study, intent was initially measured by a Likert-scaled item assessing level of agreement with a statement indicating positive intent to attend a yoga class in the future (e.g., “Assuming you had access to a free yoga class tailored for people with chronic pain what is the probability that you would attend?”). At the preliminary proposal meeting, it was suggested that this single item be expanded in an effort to incorporate the principle of aggregation into the measurement of this construct. Research has demonstrated that measuring an outcome numerous ways and aggregating the results of those multiple measurements provides a much more stable and reliable estimation than reliance on any one method of measurement alone would. This is known as the principle of aggregation (Ossenkopp&Mazmanian, 1985; Rushton, Brainerd, & Pressley, 1983). This principle was utilized in the current study in an attempt to obtain better estimates of intention.

Therefore, the measurement of intent was expanded to include seven Likert-scaled statements (one of which is reverse scored) related to participant intent to try yoga (See Table 1 for scale). Intention was measured via seven similarly worded questions and an aggregate summary of those measures was used to capture the intent outcome more accurately. Participants were asked to respond to each statement based on their level of agreement. Each of these items is Likert scaled from 1 to 10, where 1= Strongly Disagree and 10= Strongly Agree. Scores on intention items were averaged into an aggregate score for each participant to be used in analyses.

The original primary aim of the study was to assess whether CAT, FOM, and yoga attitudes served as predictors of intent to try yoga. The secondary aim included determining if a mediating relationship exists between CAT and FOM (as described in Vlaeyen and colleagues’

fear-avoidance model; Vlaeyen & Linton, 2000) in the pathway predicting intent to attend a yoga class. As an exploratory aim, we intended to examine the potential moderating effects of yoga attitudes on the hypothesized mediated relationship of CAT-FOM on intent to try yoga (See Figure 1 for original conceptual model).

The primary outcome (e.g., intent to try yoga) was intended to be analyzed through three hierarchical multiple regression analyses, exploring its relationship with each of our main variables, attitudes towards yoga (BAYS scores), CAT (PCS scores), and FOM (TSK scores). However, initial correlation analyses indicated that relationships between the predictor variables and intent were, in general, extremely weak (See Table 2). Neither CAT nor FOM was significantly correlated with intent. While attitudes towards yoga was significantly correlated ( $r = .50, p < .01$ ), it was originally conceptualized as a moderator and not a primary predictor. Therefore, the pattern of correlations did not provide adequate justification for performing a regression analysis or a subsequent mediation analysis.

Given that attitudes toward yoga did seem to be related to intent, an exploratory regression analysis was performed. Demographic variables (age, sex, ethnicity, and education) were entered into Block One, while the primary predictor variable (BAYS score) was entered into Block Two. In this analysis, only the second hierarchical step added statistically significant predictive power, suggesting that the majority of observed variance in intent was predicted by BAYS scores. Indeed, the final model predicted 23.1% of the variance in intent with BAYS scores adding the final 21.7% of prediction. Yoga attitudes ( $\beta = .51$ ) emerged as the only significant predictor in the model ( $p < .001$ ; See Table 3).

The second step of analysis would have executed Baron and Kenny's four-step mediational analysis, in an effort to confirm the structure of the fear-avoidance model in

predicting intention to try yoga as a treatment for chronic pain. However, this was not feasible due to the lack of significant relationships between predictors discovered in primary analyses.

In general, it appears that the 7-item aggregate measure of intent created for this study was not sufficient in capturing this construct in a meaningful way. Although, internal consistency for the intent measure was acceptable ( $\alpha = .74$ ), the items may not have been able to capture intent in such a way as to relate this construct to the other cognitive constructs being measured. An examination of the distribution of aggregate intent scores shows a substantial positive skew, suggesting that the majority of participants indicated a high level of intent to try yoga, regardless of responses to measures of the other constructs (i.e., CAT, FOM, attitudes toward yoga), which would have limited detection of any meaningful relationships. However, attitudes toward yoga, as measured by BAYS scores, did appear to independently predict intent, suggesting that individuals with more positive attitudes toward yoga may be more likely to indicate positive intent to try yoga than those with negative attitudes. Therefore, it appears that an individual's intent to try yoga as a treatment for chronic low back pain as measured in the current study, may be related to valence of attitudes toward yoga, in general, but to more cognitive pain-related constructs such as CAT and FOM.

Upon receiving feedback from NIH reviewers after submitting the project as an F31 grant proposal, a behavioral measure of intent to attend an informational session about yoga was added to the design of the study so that self-reported intent to attend (as measured by items on the participant interview) would not be the sole primary outcome measure. Therefore, beginning at participant number 27 (after the February 5, 2013 IRB modification approval date), participants were offered the chance to attend a free informational session (held at their site of recruitment at a later date) to learn more about how adapted yoga is used for the treatment of chronic low back

pain. This informational session was presented to participants as optional and researchers did not attempt to persuade participants to attend. It was emphasized that participants who attended the informational session would not be participating in yoga exercises or postures of any kind. Actual attendance rates of these participants at the informational session were planned to be correlated with original self-reported intent ratings to determine the relationship between intent and behavior. Ideally, doing so allows measurement of the predictive power of well-formed intent on actual behavior. However, out of 58 participants who were invited to attend informational sessions at varying time points, only one participant attended a session.

Failed attempts at implementing the initial behavioral measure seemed to indicate that this may not be the easiest or most accessible way to obtain behavioral data from participants and may also inhibit the participants' access to meaningful information. The low attendance at the informational sessions can likely be attributed to a variety of factors (e.g., transportation limitations, time constraints). Given the many factors that may have prevented individuals from attending these sessions, it is hard to make any valid assumptions about the relationship between self-reported intent to attend and actual attendance. Therefore, it was clear that a simpler method of observing behavioral intent outcomes was needed.

An informational DVD was created that provided information on how adapted yoga might be utilized for chronic low back pain. Instead of being offered the opportunity to attend an informational session post-study, each participant, starting at participant number 86, was given an informational DVD and was invited to watch it at home and then asked to return, via mail, a simple questionnaire assessing their information seeking behavior (i.e., "Did you watch the DVD?", "Since participating in the study, have you sought out more information about yoga?"). An additional \$1 was included in the DVD package as a way to preemptively thank participants

for completing this behavioral task. By handing participants an informational DVD at the time of the study, we hoped to eliminate any additional time or financial burden (i.e., gas money and time needed to drive to information sessions) and provide all participants with valuable information. However, out of the thirty-one participants who were given a DVD and asked to return the questionnaire, only 10 did so, precluding any meaningful analyses. Therefore, it again appeared that the effort required to complete a behavior may have been a barrier to accurate measurement of participant intent. In addition, it is possible that participants may have felt that simply watching a DVD lacked real-life applicability in their search for low back pain treatment.

As previously mentioned, the distribution of the intent scores was positively skewed, indicating that, regardless of beliefs and attitudes, most participants indicated a high level of intent to try yoga for chronic low back pain treatment. This led researchers to believe that participants would likely follow through on behavioral measures. However, self-reported intent did not translate into behavior, as evidenced by poor participation on both of the implemented behavioral measures.

Perhaps this is not surprising, as previous intention research has suggested that, although intention is necessary for behavior, self-reported intent does not often lead to actual behavior (Morwitz et al., 1993). In addition, there are theories that simply assessing intent has the potential to change behavior either by making attitudes more readily available to the individual or by changing the attitude itself (Morwitz et al., 1993), both of which can thus influence resulting behavior. It is possible that assessing intent, in the current study, could have either made individuals more aware of their attitudes toward yoga (i.e., made them more certain of their trust in biomedical treatments versus alternative ones) or even changed those attitudes (i.e., after

reporting positive intent, realizing one did not feel positive about trying yoga), both of which would have easily contributed to poor participation in the behavioral outcome measure.

In addition, there are important aspects of an individual's intention to perform a behavior that cannot be captured through generic self-report assessments. For example, an individual's intention may be positive, but vary in strength and or priority. A person may have a positive attitude toward a target behavior and intend to engage in the target behavior, but the motivation for this intention may be less than intention motivation in a different context, therefore decreasing the chances intention will translate into actual behavior (Sheeran& Abraham, 2003). Volitional control is another factor that may influence the relationship between intention and behavior. Research suggests that measuring intent, without also measuring perception of control, may weaken the relevance of the intent measure as it is reasonable to only expect intention to translate into behavior if the individual also perceives having actual control over performing the behavior (Webb &Sheeran, 2006). Although intention is suggested as a crucial factor for behavioral outcomes in several health behavior theories (e.g. the theory of planned behavior, social cognitive theory), it remains that the link between intention and subsequent behavior is often weak (Morwitz et al., 1993; Sheeran& Abraham, 2003).

**Table 1.**Expanded 7-item Likert-scaled Intent Measure

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1. If I had the opportunity to attend a free information session to learn more about using yoga to treat chronic pain, I would attend.

2. If I had access to a free yoga class that was modified for my chronic pain condition, I would attend.

3. In the future, I could see myself attending a yoga class.

4. I plan to attend a yoga class in the near future.

5. I am open to trying yoga as a treatment for chronic pain.

6. I plan to find out more about using yoga for chronic pain.

7. I don't really want to learn more about using yoga for chronic pain.\*

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*Note.* All items were answered on a 10-point Likert scale where 1 = strongly disagree and 10 = strongly agree; \* = reverse scored item.

**Table 2.** Pearson's Correlations Between Independent and Dependent Variables

| Variables | BAYS   | PCS   | TSK  | Intent |
|-----------|--------|-------|------|--------|
| BAYS      |        |       |      |        |
| PCS       | -.33** |       |      |        |
| TSK       | -.56** | .64** |      |        |
| Intent    | .50**  | .03   | -.15 | 1.0    |

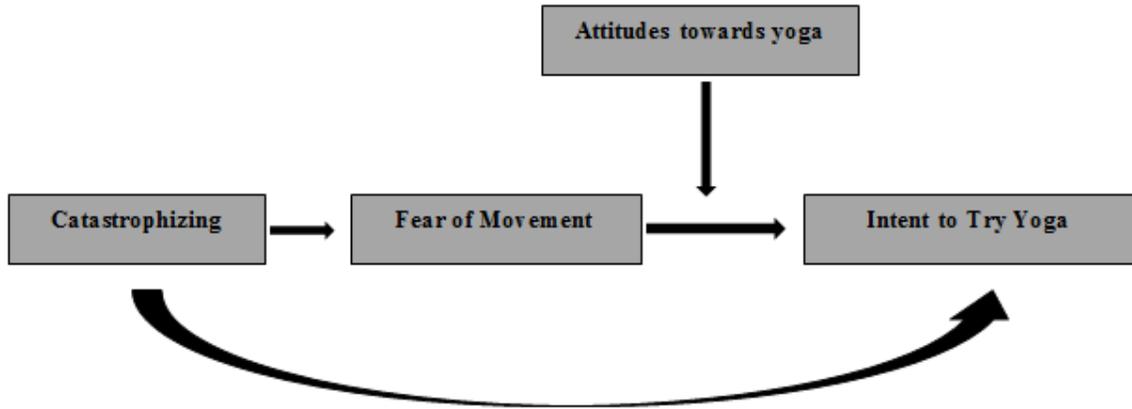
*Note:* BAYS = Beliefs About Yoga Scale; PCS = Pain Catastrophizing Scale; TSK = Tampa Scale for Kinesiophobia; \* =  $p < .05$ , \*\* =  $p < .01$ .

**Table 3.** Summary of Hierarchical Regression of Intent on BAYS Scores

| <u>Catastrophizing</u> | <i>b</i> | $\beta$ | <i>t</i> | <i>p</i> | R <sup>2</sup> | R <sup>2</sup> <sub>Δ</sub> |
|------------------------|----------|---------|----------|----------|----------------|-----------------------------|
| Block 1:               |          |         |          |          | .01            | --                          |
| Age                    | -.01     | -.14    | -1.26    | .21      |                |                             |
| Sex                    | .72      | .18     | 1.73     | .09      |                |                             |
| Ethnicity              | .01      | .01     | .06      | .95      |                |                             |
| Education              | .06      | .07     | .65      | .52      |                |                             |
| Block 2:               |          |         |          |          | .23            | .22                         |
| BAYS Scores            | .07      | .51     | 5.02     | <.001    |                |                             |

*Note:* BAYS = Beliefs About Yoga Scale

Figure 1. Mechanisms Affecting Intent to Try Yoga: A Moderated Mediation



## **Appendix B: Qualitative Analyses**

The practice of yoga originated in India thousands of years ago with traditional goals of uniting mind, body, and spirit for physical and mental well-being (Desikachar, 1995). Yoga has been traditionally defined as a combination of physical movements, coordinated, intentional breathing techniques, and mindful awareness (Desikachar, 1995). The National Center for Complementary and Alternative Medicine (NCCAM) defines yoga as a mind-body practice that combines breathing, physical movements, and meditation or relaxation techniques to benefit health and well-being (National Center for Complementary and Alternative Medicine [NCCAM], 2012, May 29) and yoga is becoming increasingly recognized in the United States (U.S.) as an activity with both psychological and physiological benefits (Cramer et al., 2013; Ross & Thomas, 2010). In fact, yoga is beginning to be considered a viable integrative treatment for a variety of physiological conditions (Barnes, Bloom, & Nahin, 2008). Positive effects (i.e., decreases in physical symptoms) for yoga have been found for such conditions as diabetes, multiple sclerosis, kidney disease, breast cancer, heart disease, and chronic pain (see review in Ross & Thomas, 2010). The current study is focused on yoga's potential to be considered a possible integrative treatment in a population of individuals with self-reported chronic low back pain.

Chronic low back pain has been established as a significant public health problem in the US, one that costs significant amounts of money in both treatment costs and lost productivity (Institute of Medicine [IOM], 2011). More than 80% of the American population will experience low back pain at some point in their life (Rubin, 2007) and chronic low back pain is the second most common cause of disability status in American adults (Brault, Hootman, Helmick, Theis, & Armour, 2009) and one of the most common reasons that individuals seek consultation from

their primary care providers (Macfarlane et al., 2012). Traditional biomedical treatments (e.g., medication and surgery) for chronic low back pain are expensive (with estimated annual costs of \$62.5 billion and \$4.7 billion, respectively; Gatchel&Okifuji, 2006), often do not result in long-term improvement of pain, and pose high risks for significant side effects (Bruckenthal, Reid, &Reisner, 2009; Fitzcharles, Lussier, &Shir, 2010; Gatchel&Okifuji, 2006; Turk, 2002). Therefore, it is important to provide treatments for chronic low back pain that are not only effective, safe, and cost-effective, but also to provide individuals with multiple treatment options, rather than requiring them to rely solely on expensive, invasive procedures with potentially serious side effects.

Yet, the use of complementary and/or alternative medicine (CAM) as part of integrative care for chronic low back pain is not yet considered to be widely acceptable in the US. In recent years, however, the treatment of chronic pain conditions with CAM techniques has increased in acceptance and popularity (Eisenberg et al., 2012; Kanodia, Legedza, Davis, Eisenberg, & Phillips, 2010; Tindle, Davis, Phillips, & Eisenberg, 2005). It is estimated that approximately 6% of Americans with chronic low back pain have utilized at least one CAM technique in an effort to treat their pain (Kanodia et al., 2010). Early empirical evidence suggests that yoga is a CAM treatment that is feasible and efficacious for treating chronic low back pain in adults, when compared to control groups and medical treatment as usual (Galantino et al., 2004; Groessl, Weingart, Aschbacher, Pada, &Baxi, 2008; Kelly, 2009; Tekur, Singphow, Nagendra, &Raghuram, 2008).

Even with research demonstrating its benefits, individuals may have attitudes toward yoga that play a significant role in determining whether or not they will be open to trying it, in general, or as a treatment for chronic low back pain. These attitudes may be influenced by such

variables as age, gender, ethnicity, culture, geography, and previous experience. A simple lack of knowledge about yoga or other CAM treatments often contributes to misperceptions about and lack of participation in such treatments. This may be especially true for yoga, as its origins and background are often misunderstood. For example, yoga is frequently considered by non-practitioners to be a form of religion and this has been noted by non-practitioners as a barrier to participation (Atkinson & Permuth-Levine, 2009). Individuals with chronic pain, in particular, may be afraid that a movement-based therapy would exacerbate their pain, and therefore be less willing to try it.

In 2009, Atkinson and Permuth-Levine conducted a qualitative study examining the perceived benefits of and barriers to yoga in a general population. Results of this study demonstrated perceived benefits tended to center around the themes of health promotion and wellness, disease prevention, and social/psychological benefits (Atkinson & Permuth-Levine, 2009). Individuals noted barriers to practicing yoga, such as, time (e.g., long duration of class), cost (e.g., buying own equipment), perceived negative health effects (e.g., difficulty for people with certain physical conditions), and other negative pre-existing conceptions (e.g., lack of aerobic challenge, religious conflicts; Atkinson & Permuth-Levine, 2009). In spite of suggested barriers, individuals with any previous yoga experience tended to recognize the potential benefits of yoga, whether or not these benefits applied directly to them. Since research examining barriers and motivators to yoga practice has been conducted in general, but never in a specific chronic pain population, it is important to assess what obstacles individuals with chronic low back pain perceive as preventing them from engaging in a potentially beneficial treatment and how these might be different from those perceived by a general population.

## **Methods**

### **Participants**

Participants were 102 community-residing adults, ages 19 to 84 (mean age = 50.5 years), who self-reported having chronic low back pain (pain resulting from an injury or condition that is significant and has lasted at least six months). Participants were recruited as part of a larger study from a collegiate town in western Alabama via publicly distributed flyers, announcements in local newsletters, and in-person recruitment at a number of community sites. An incentive of \$10 was paid to participants for completion of the entire study. Recruitment was limited to participants who were without significant cognitive deficit, able to communicate in English, and who were not reporting acute pain (defined as temporary pain resulting from a specific injury) as a primary pain source. There were no exclusions based on sex or ethnicity.

### **Procedure**

Participants were asked to respond to a semi-structured interview. They provided information on their age, sex, ethnicity, marital status, and level of education as part of the interview. Participants were also asked to provide information about their pain history (including pain duration and intensity), level of exercise, previous yoga experience, and attitudes towards yoga. The majority of information included in the interview was used for descriptive purposes, aiding in describing general participant characteristics as well as in gathering qualitative information related to participants' attitudes toward yoga. The two main items considered for qualitative analysis in the current study addressed participants' opinions about what might motivate or prevent someone from trying yoga and were worded "What might motivate someone to try yoga?" and "What might prevent someone from trying yoga?" respectively. An additional item assessing participants' perceptions of yoga as harmful or beneficial in the context of having

chronic low back pain was also included. This item asked participants to respond to a statement, worded “Given my chronic pain condition, if I practiced yoga, it would be,” using a scale of 1 (Harmful) to 7 (Beneficial).

As part of the larger study, participants also completed the Pain Catastrophizing Scale (Sullivan, Bishop, & Pivik, 1995), the Tampa Scale for Kinesiophobia (Miller, Kopri, & Todd, 1991), and the Beliefs About Yoga Scale (Sohl, Schnur, Daly, Suslov, & Montgomery, 2011).

Participants were either recruited on-site at one of the participating community locations or saw a flyer and scheduled an appointment via phone or e-mail. All participants completed the study in person with a researcher associated with the University of Alabama Pain Research Lab. After giving informed consent participants completed the semi-structured in-person interview, along with other measures administered for purposes of the larger study. At the completion of the interview session, participants were compensated \$10 for their time and effort in completing measures and responding to interview questions.

### **Analytic Approach**

A qualitative analysis of two open-ended items on the study interview, those directly asking about potential barriers and facilitators to yoga practice was conducted utilizing the thematic approach described by Braun and Clarke (Braun & Clarke, 2006). This technique is widely used in psychological research and involves the identification of patterned responses (themes) in the data by designated coders. The goal of these qualitative questions was to explore the opinions of adults with chronic low back pain related to what might motivate or prevent someone from trying yoga.

Qualitative analytic steps included: (1) preparing the data for analysis; (2) initial reading of interview responses; (3) re-reading of the interview responses with annotations of potential

coding themes; (4) sorting items of interest into proto-themes; (5) examining the proto-themes and attempting initial definitions; (6) axial coding; and (7) constructing the final form of each theme (Braun & Clarke, 2006). First, items of interest were reviewed for each participant by 2 coders (primary author and research assistant). The coding team then independently reviewed the participant responses to the first item (facilitators) and the second item (barriers), coding separate responses according to thematic interpretation. After coding all of the responses, each coder sorted the codes into potential themes; the coding team then met to discuss and compare the independently identified themes. This occurred for four rounds of coding, where themes were narrowed further in each round. New themes and refinements to identified ones were discussed initially by the two-person coding team at regularly scheduled meetings. The analysis team kept detailed notes as part of an audit trail, documenting each step of the coding process to help document analytic decisions (Bradley et al., 2002). A senior member of the research team reviewed final identified codes developed by the coding team as a means of facilitating rigor and trustworthiness in the qualitative data (Cohen & Crabtree, 2006).

Participant answers to one additional Likert item assessing beliefs about yoga's potential to be harmful or helpful in the context of chronic pain were also analyzed to provide a greater understanding of their expressed perceived barriers and facilitators.

## **Results**

Participants were 60.8% female with an average age of 50.5 years. Approximately 47% of participants had a college degree, suggesting that the sample was highly educated in comparison to the general population. Approximately 58% of the sample had never practiced yoga before at the time of study completion. Of those who had tried yoga in the past, 86% had not done yoga in the past month. See Table 1 for sample descriptives for the entire sample.

Coding procedures identified five main response themes for barriers and six for facilitators to the practice of yoga in this population. Many participants listed more than one barrier and/or more than one facilitator.

### **Perceived Facilitators**

Facilitators identified for the practice of yoga in this study population were varied and included a range of topics outside of those related to chronic pain. These topics were grouped into six overall themes.

**Physical Issues.** A large number, 44.3%, of participants listed physical issues as primary reasons for which one would be motivated to try yoga and 18% of this subset of respondents noted having chronic pain as a specific physical issue that might draw someone to yoga. Participants noted that a desire for improvement of health and physical well-being would be an important reason one might try yoga. Noted desirable physical improvements that may come from yoga included: increased flexibility and range of motion, improved sleep quality, improved bodily strength, decreased blood pressure, weight loss, and pain relief. One participant stated, “For people in pain, the strengthening exercises [in yoga] are supposed to help,” while others noted that yoga had the potential to reduce stiffness and ease pain in the low back and other areas of the body. Four participants reported that motivation to try yoga would be increased if it were recommended by a medical professional. Lastly, viewing yoga as an exercise option (and specifically a low-impact exercise option) was noted as a potential facilitator. Participants noted that there are many benefits one may get from yoga that also occur in other exercise regimens (e.g., strengthening) and that yoga may be a “holistic way to exercise” or “something you could do for a fun exercise.”

**Cognitive/Affective Issues.** Cognitive/affective issues were identified as facilitators by 15.5% of participants. Participants reported that an individual who has high stress levels or needs to relax may look to yoga for stress-relief and mind-body relaxation. It was noted that yoga has a calming effect that may be appealing to individuals during times of stress. It was also indicated that individuals might seek a yoga practice for mood improvement (i.e., individuals with depression or anxiety.) One participant stated that “someone living in a stressful environment and seeking peace” may be motivated to try yoga. Participants also noted that certain cognitive characteristics of a person may make him or her more likely to try yoga, for example, having an open-mind or a generally positive outlook on new experiences.

**Motivational Issues.** Overall, motivational issues were reported by 13.4% of participants. Curiosity was noted as the most common motivational issue that may encourage someone to try yoga. Participants suggested that individuals who are curious about yoga or who want to try something new may be more likely to engage in yoga practice. One participant stated that an individual who wanted to “try a different method of being healthy” may be motivated to try yoga, while others noted that “wanting the body to feel better” or “committing to being in better condition” would be motivational issues that may facilitate engagement in yoga. Yet another motivational issue centered on the perception that yoga “seems fun” or “seems enjoyable” which may motivate individuals to try it.

**Informational Issues.** Informational issues were identified by 15.5% of participants as facilitators to yoga practice. Participants noted that individuals may be more motivated to try yoga if they were provided accurate information about what yoga is as well as its potential benefits. They indicated that the provision of more explanation may clarify confusion or misconceptions (i.e., that yoga is “new-age”, only for women, or not an exercise). One

participant expressed belief that “If it [yoga] were marketed differently or advertised more as a physical exercise versus a passive meditation” more people would try it. Others indicated that hearing positive testimonials from others would help motivate individuals to try yoga.

Participants stated that “hearing a personal testimony from someone who participates and has similar [physical] limitations themselves”, “being around someone who has been through it”, and “seeing how it has helped others improve” would facilitate engagement in yoga. Lastly, seeing a yoga demonstration or observing a class was noted as a potential facilitator for trying yoga.

**Practical Issues.** A small number of participants, only 8.2%, reported practical issues as potential facilitators to trying yoga. It was noted that if a class were free or if there were an incentive for going, one might be more motivated to attend a yoga class. Participants also reported that convenience (time and location) were important factors to consider in the motivating individuals to try yoga. One participant stated that people would be motivated to try yoga if “someone were offering a free class at work”, demonstrating both financial and convenience issues as important factors. Two participants noted that a positive class environment would be a motivating factor, stating that “having an instructor encourage you”, “doing it in a small group”, and “the non-judgmental atmosphere of class” would be facilitating factors.

**Social Issues.** Social issues were noted by 14.4% of participants. Participants noted that individuals may be more inclined to try yoga if it were recommended by a friend or if friends persuaded them to go. “Having a friend go with you” was also a common social issue that arose as a facilitating theme among these respondents.

### **Perceived Barriers**

Participants identified a variety of potential barriers to practicing yoga, some of which related to their chronic low back pain, and some of which did not.

These topics were grouped into five of the same overall themes identified under facilitators: physical issues, cognitive/affective issues, motivational issues, informational issues, and practical issues. Social issues were not mentioned as a category related to perceived barriers.

**Physical Issues.** Thirty-one percent of respondents cited physical issues as barriers and of that subset of participants, 9.6% listed chronic pain as a specific barrier. Participants seemed to identify numerous physical health issues that would possibly prevent someone from trying yoga. Health conditions identified as potential barriers included having poor balance or poor flexibility, being out of shape or overweight, having chronic pain, and more generally having “poor health”, or “medical problems.” One participant noted that it would seem unlikely that a person would consider trying yoga if he felt he was “limited physically.”

**Cognitive/Affective Issues.** Cognitive/affective issues were identified by 31.3% of participants as potential barriers to yoga practice, the majority of which centered on fear in two different areas. Fear of pain or injury as a result of doing yoga was noted as a potential barrier by 35% of this subset of respondents, with participants suggesting that people may not be willing to participate if they thought they might hurt themselves doing the poses. In addition, fear of trying something new or being inexperienced was indicated as a limiting factor. Participants described fear of being embarrassed, fear of being compared to or judged by others in class, fear of being unable to do the poses correctly, and general intimidation related to doing a new activity as barriers in this area.

**Motivational Issues.** Approximately 11% of total participants noted motivational issues as a potential barrier. Lack of motivation, laziness, and general lack of interest were identified by participants as motivational issues that may prevent someone from trying yoga. Some participants also noted that the belief that yoga is “boring” or “not a good enough exercise” may

deter some individuals from trying it. Dislike of physical activity, in general, was also noted as a potential reason someone may not be interested in trying yoga. One participant also noted that individuals who “don’t want help” with a physical issue may be unmotivated to try yoga.

**Informational Issues.** Of study participants, 36.4% listed informational issues as being primary barriers to participation in yoga. Informational issues identified included: lack of adequate information, lack of accurate information, disbelief in yoga’s potential to be helpful, misunderstandings about what yoga is, and negative preconceptions. Many participants noted that “not having information,” having a “lack of knowledge,” or “being uneducated” about yoga would be a primary barrier. Responses indicated that lack of information about yoga may lead someone to be unsure of what yoga involves, who goes to yoga, what would be required physically, the level of difficulty and the potential benefits yoga may offer. Specifically noted was yoga’s “perceived lack of manliness”, with one participant stating, “A lot of men think it is sissy compared to other exercises.” Also included in informational issues was the identification of stereotypes that may prevent individuals from trying yoga. For example, it was noted that “someone who is very religious and not open-minded” might be hesitant to try yoga. Another participant stated that “People might think that it [yoga] is too new-age or anti-Christian.” Yet another indicated that the fact that yoga “originated in a different culture” might be a deterrent to some. Participants identified “stigma” associated with yoga, noting that it may be considered “a hippy thing”, “cultish”, “way-out”, or “off-beat”.

**Practical issues.** Practical issues were identified by 12.1% of participants as important in determining why someone might not try yoga. Issues in this theme included time constraints, financial limitations, transportation difficulties, and lack of convenience or availability of yoga.

## **Relationship of Pain Intensity and Duration to Perceived Barriers and Facilitators**

Descriptive analyses indicated that the overall average pain intensity reported by the current sample was 5.85 on a scale of 0 (no pain) to 10 (extreme pain) while the average pain duration was 143.58 months (or approximately 12 years). Individuals mentioning pain as a reason to try yoga had an average intensity rating of 6.75 ( $SD = 2.31$ ) and a duration of 78.00 ( $SD = 52.89$ ) months (about 6.5 years). Those who mentioned having pain as a barrier to yoga practice had a slightly higher average intensity rating of 7.67 ( $SD = 2.08$ ) and higher duration of 216.00 ( $SD = 157.38$ ) months (18 years).

In an effort to examine how pain intensity and duration affected participants' perceptions of barriers and facilitators, hierarchical regressions were utilized as exploratory analyses. Two simple linear regressions were run, one examining the relationship between pain intensity and participants' responses to the item assessing perception of yoga as harmful or beneficial, and another assessing the relationship between pain duration and the same item. In the first regression, pain intensity emerged as a significant predictor ( $\beta = -.298, p < .05$ ) of participants' ratings of yoga as harmful or beneficial, such that the higher the pain intensity rating the more likely participants were to rate yoga as harmful. However, results of the second regression suggest that there was no significant relationship between pain duration and this rating ( $\beta = .05, p = .59$ ).

## **Discussion**

Although some research has focused on the benefits, barriers, and cues to action of yoga in a general population (Atkinson & Permuth-Levine, 2009), the examination of factors influencing attitudes toward yoga in a sample of individuals with chronic low back pain is a step that has been neglected thus far in fields of pain and yoga research. Identifying perceived barriers

and facilitators to trying yoga in a population of individuals with chronic low back pain is important, as yoga has been shown to have beneficial effects when used as a treatment for low back pain. In addition, it is important to identify differences in the reported barriers and facilitators to yoga reported in this pain population as compared to a more general (i.e., non-pain) population (as assessed by Atkinson and Permuth-Levine in 2009).

Regardless of whether or not participants had tried yoga in the past, they appeared to perceive common barriers and facilitators to yoga practice. Overarching themes noted by participants for both barriers and facilitators included physical, cognitive/affective, motivational, informational and practical issues, while social issues emerged as a theme for facilitators only.

### **Physical issues**

As yoga involves physical movement, it was expected that physical issues would appear as prominent themes in both perceived barriers and facilitators to trying yoga. Although yoga, unlike some other physical activities, has the potential to be adapted for many physical limitations and health conditions, this is not well-known by the general public. Therefore, the fact that many participants would indicate that physical limitations (e.g., lack of flexibility, injuries, medical problems, pain) may prevent someone from trying yoga is not surprising. However, other participants appeared to be aware of yoga's potential health benefits and indicated that individuals with health issues (e.g., high blood pressure, overweight, restricted range of motion, pain) may be motivated to try yoga in an effort to treat or alleviate those problems. In addition, participants noting yoga's potential benefits also tended to be aware of yoga as an exercise, where typical exercise-related benefits (i.e., strength, heart health) could be obtained. It seems as if there exists mixed information about yoga, where some view it as an activity to be done only when in good physical condition and others acknowledge its potential to

aid in improving physical health. These general physical issues are consistent with ideas reported by participants in the 2009 Atkinson &Permeth-Levine study, which found participants listing numerous physical benefits of doing yoga (e.g., improving blood pressure, balance, strength, and weight), yet also noting physical limitations (e.g., lack of flexibility, presence of injury or pain) as a barrier (Atkinson &Permeth-Levine, 2009). This suggests that, regardless of the presence of pain, physical issues are common topics related to individuals' willingness or motivation to try yoga.

It is interesting to note that chronic pain, a physical issue experienced by all of the participants in the current study, was mentioned as a barrier by some, a facilitator by some, and not at all by others. Overall, only 10% of the total number of participants noted having chronic pain as either a barrier or facilitator to trying yoga, a surprisingly small percentage given that the study was conducted in a population of individuals with self-reported chronic low back pain. This would suggest that individuals might see reasons for trying or not trying yoga as somewhat separate from their pain. However, more general physical issues were the most commonly listed facilitator and the second most commonly listed barrier to trying yoga. Therefore, it may be important to introduce yoga as a way to more broadly benefit physical health, particularly specific health issues that may be of interest to individuals with chronic pain (e.g., strength-building, improving flexibility and balance, reducing stiffness), as it seems that chronic pain does not appear to be a main motivator (or barrier) in and of itself.

Regarding why some saw chronic pain as a barrier and some as a facilitator to trying yoga, it is likely that attitudes and perceptions about one's pain experience would be determining factors. It is possible that one's level of pain intensity and/or pain duration may play a role in whether or not an individual sees himself as capable of trying yoga. Overall, this self-reported

pain population appeared to have a modest level of pain intensity (average rating of 5.85 out of 10), with an average pain duration of approximately 12 years. There were some differences on these constructs between individuals who mentioned pain as a barrier or a facilitator, with participants who reported pain as a barrier averaging slightly higher pain intensity and duration. However, given that only eight people noted pain as a facilitator and only three as a barrier, any potential differences between this small subsample are likely not meaningful for the majority of participants. Results of the exploratory analyses suggest that pain intensity was significantly related to perception of yoga as either harmful or beneficial such that the lower the reported intensity of the pain, the more likely an individual is to perceive yoga as beneficial in the context of having chronic low back pain. Pain duration, however, does not seem to be related to one's perception of whether or not yoga will be helpful for pain. This suggests that, regardless of how long an individual has had chronic low back, the perceived intensity of the pain may influence perceptions of barriers and facilitators to trying yoga. Further, pain intensity may also influence willingness to consider any treatment program that integrates physical movement, such that individuals with high levels of perceived intensity of pain may be less willing to try yoga or any other movement-based therapy.

### **Cognitive/Affective issues**

Cognitive and affective issues were prominent themes for both barriers and facilitators to trying yoga. As a barrier, these issues centered on fear or apprehension, while listed facilitators were more focused on stress-relief and mood improvement. Many participants seemed to fear that trying yoga would result in pain or injury, regardless of whether or not they had tried yoga before. Even though few participants (only 10% of the sample) specifically noted chronic pain as either a barrier or facilitator, it is possible that this concern could be more pronounced in the

current population, as having pain may increase fear of further pain or pain-related injury. Pain research has suggested that individuals with chronic pain often avoid physical activity in an effort to prevent their pain from worsening (Vlaeyen & Linton, 2000). Perhaps such avoidance has the potential to lead to general disinterest in exercise that might prevent individuals with pain from being motivated to try yoga, underscoring that fear-avoidance tendencies are an important area to target in pain treatment. Atkinson and Permuth-Levine's results suggested that some participants associated yoga with increased risk of worsening pre-existing physical issues, but did not identify fear as a theme, specifically (Atkinson & Permuth-Levine, 2009). Thus, the perception of yoga as a potentially risky activity may be widespread but fear of injury may be more of an issue for individuals with chronic pain conditions.

Other concerns reported by participants included fear of trying something new and fear of being judged by others, both of which are understandable emotions for an individual engaging in an unfamiliar activity about which they may have little or inaccurate information. Again, the 2009 study by Atkinson and Permuth-Levine found similar results, with participants noting that self-consciousness in classes may be a barrier to trying yoga (Atkinson & Permuth-Levine, 2009).

Expectations often play a large role in determining behavior. Participants' apprehension, noted above, may encourage negative expectations about engaging in yoga, resulting in hesitance to try it. Yet, some participants seemed to have positive expectations about yoga's potential to relieve stress, facilitate calm and relaxation, and improve mood issues, themes similarly noted in the Atkinson study. Given the strong association between chronic low back pain and mood issues (Gore, Sadosky, Stacey, Tai, & Leslie, 2012), promoting these potential benefits may be an important way of motivating individuals with pain to try yoga. In fact, previous research has demonstrated that yoga improves anxiety and depression in individuals with chronic low back

pain (Tekur, Nagarathna, Chametcha, Hankey, & Nagendra, 2012), supporting this as an important component of yoga to emphasize, specifically in a population with chronic pain.

### **Motivational issues**

Despite the potential benefits of an activity, an individual will only engage in it if motivated to do so. Therefore, it is not surprising that motivational issues emerged as common themes serving as barriers or facilitators to trying yoga in the current population. Participants discussed that being curious or desiring to try something new were motivational states that would serve as facilitators, while lacking interest in yoga or lacking general motivation to try anything new would be barriers. Laziness and general disinterest in physical activity were also noted as barriers. It is interesting to note that such specific motivational issues did not seem to emerge from Atkinson's study in a general population, where only one participant noted that disinterest in beginning a new activity would be a barrier (Atkinson & Permuth-Levine, 2009).

### **Informational issues**

Informational issues were noted as the most common barrier and the second most common facilitator to trying yoga. Regardless of whether they were listed as a barrier or a facilitator, these issues centered on the fact that individuals may be hesitant to try yoga due to lack of adequate information and might be motivated to try it were more explanation provided. Participants noted that many individuals may have negative preconceptions about what yoga is and may believe certain stereotypes that might prevent them from feeling comfortable trying yoga. Examples of stereotypes reported included ideas that yoga may conflict with certain religious beliefs, may be a feminine activity, may not be a worthwhile exercise, or may be an alternative activity that would be looked down upon by mainstream culture. It was suggested by participants that provision of accurate information about yoga, including an explanation of its

history and potential physical benefits may help to clarify potential misconceptions and motivate people to try it. This type of misinformation (i.e., notions that yoga is female dominated, too earthy, or poses religious conflict) has been identified previously as a common barrier to yoga practice (Atkinson &Permuth-Levine, 2009) and the findings of the current study underscore the importance of presenting yoga in an accurate and consistent way to the general public and, maybe especially, to individuals with chronic pain, as misinformation may prevent them from engaging in an efficacious complementary treatment. Methods of providing such explanation included listening to positive testimonials, seeing a demonstration of poses, or observing an entire class.

### **Practical issues**

Practical issues arising in the identification of barriers and facilitators to yoga practice were expected and understandable. Convenience was noted as a facilitator to yoga practice, with participants noting that they would be more likely to try yoga if it were convenient in regards to time, location, cost, and accessibility. Understandably, lack of convenience in these areas was a commonly reported theme that might prevent someone from trying yoga. As with many extracurricular activities, time constraints play a role in whether or not someone will participate and time has been noted as a potential barrier to yoga in previous research (Atkinson &Permuth-Levine, 2009). In both the current study and the Atkinson study, many participants seemed to express the belief that they did not have time to begin or maintain a yoga practice, regardless of the benefits they may experience. Financial difficulties (and related lack of transportation) were also practical issues noted as barriers in the current study, but not in previous research. As part of the semi-structured interview, participants were asked how much they would be willing to pay for one yoga class. Nearly 20% of participants indicated that they would not be willing to pay

anything to attend a yoga class, supporting the identified facilitating theme that access to a free class would be a motivator to try yoga. Overall, it seemed that many participants, especially those without any previous yoga experience, did not have a clear idea about the typical cost of yoga classes. The introduction of yoga classes into convenient locations with consideration of time, cost, and accessibility seems to be an important need. Perhaps holding group yoga classes at medical centers, where low back pain patients may be going for appointments anyway, would be an important step into overcoming these practical barriers.

### **Social issues**

Interestingly, social issues emerged as a theme for facilitators, but not for barriers to yoga practice. This trend was also found in Atkinson and Permuth-Levine's study, where participants in a general population noted that attending yoga with friends and having an opportunity to socialize were specific benefits. In the current study, it seems like participants believed that having a friend go with them to yoga or having a friend recommend yoga in the first place would increase their likelihood of trying it. Overall, it seems that yoga may offer potential social benefits that increase an individual's willingness to try it.

### **Limitations and Future Directions**

There were a few limitations to the current study. For example, although most important to the aim of the study, responses used for qualitative analysis were brief and may not have provided as much useful information had participants been asked to provide more comprehensive answers. In addition, it may have been useful to hold focus groups for participants to further discuss potential barriers and facilitators after data was collected in the original study. However, this was not feasible. Lastly, participants included individuals who had and had not tried yoga. Although over half of the study sample had never tried yoga and, of those who had, very few

were regular practitioners; interpretation may have been simpler if all participants had no previous yoga experience.

The sample was highly educated relative to the general U.S. population (United States Census Bureau, 2012), with approximately 50% having at least a college degree. This is likely related to the fact that recruitment took place in a large university town. However, researchers in the original study intentionally chose a broad range of sites in this location (e.g., a university recreation center, a federally qualified health clinic) in an effort to obtain a more generalizable sample. It is estimated that only 28% of individuals in the U.S. have a bachelor's degree or higher (United States Census Bureau, 2012). Therefore, educational attainment in the current sample is greater than in the general population and may have affected perceptions of barriers and facilitators to trying yoga. Extant research suggests that yoga practitioners are more likely to have higher educational attainment (Cramer et al., 2013) and individuals with a college degree or higher are more open to CAM treatments in general (Tindle et al., 2005). Therefore, it is likely that the educational level of many participants in the sample affected attitudes toward yoga.

## **Conclusion**

In general, the barriers and facilitators identified by participants with chronic low back pain in the current study do not seem to be largely disparate from the barriers and benefits identified by Atkinson and Permuth-Levine's general population in 2009. Both populations noted physical issues, cognitive/affective issues, informational issues, practical issues, and social issues as potential barriers or facilitators/benefits. Even some participants in the 2009 general sample noted that having pain may be a barrier to trying yoga, while others noted a benefit may be the prevention or reduction of pain symptoms (Atkinson & Permuth-Levine, 2009).

Overall, it appears that individuals with chronic low back pain perceive a variety of barriers and facilitators to yoga practice. Although many of the identified themes have the potential to be specifically relevant to the experiences of individuals with chronic pain, overall, the majority of participants did not seem to see the simple fact that they had chronic pain as either a definite barrier or facilitator to trying yoga. Instead, the fear of pain or injury seemed to be more prominently identified as a barrier, a theme that appeared to be more prominent in the current pain population when compared to the general sample. Therefore, the promotion of yoga as an integrative treatment for chronic low back pain may need to emphasize the provision of accurate information about yoga, the promotion of its benefits for specific issues rather than for chronic pain, in general, and intervention for patient's potential fears that participating in yoga will cause or exacerbate their pain.

**Table 1.** General Sample Descriptives

| Variable            | Descriptive/ M (SD)       |
|---------------------|---------------------------|
| Sex                 | 60.8% female              |
| Age                 | 50.5 (18.01) years        |
| Education           | 47.1% with college degree |
| Pain Intensity      | 5.85 (2.51)               |
| Pain Duration       | 143.58 (165.12) months    |
| Never tried yoga    | 57.8% of sample           |
| Yoga benefit rating | 5.12 (1.66)               |

*Note.* Pain intensity ratings were on a scale of 0 (no pain) to 10 (extreme pain). *Yoga benefit rating* refers to participant responses to the item “Given my chronic pain, if I practiced yoga, it would be:” where participants answered on a scale of 1 (harmful) to 7 (beneficial).

**Table 2.** Common Themes Expressed by Study Participants

|  | <b>Barriers</b>   | <b>Facilitators</b>   |
|--|---|---|
| <b>Physical Issues</b>                 | <ul style="list-style-type: none"> <li>• Chronic pain</li> <li>• Physical limitations</li> </ul>  | <ul style="list-style-type: none"> <li>• Chronic pain</li> <li>• Desire for improved physical health</li> <li>• Exercise</li> </ul>   |
| <b>Cognitive/<br/>Affective Issues</b> | <ul style="list-style-type: none"> <li>• Fear of pain or injury</li> <li>• Fear of trying something new</li> <li>• Fear of being compared to others in class</li> <li>• Disbelief in own ability</li> </ul> | <ul style="list-style-type: none"> <li>• Stress-relief and relaxation</li> <li>• Mood improvement</li> <li>• Having an open-mind or positive outlook</li> </ul>   |
| <b>Motivational Issues</b>             | <ul style="list-style-type: none"> <li>• Laziness</li> <li>• Lack of motivation</li> <li>• Lack of interest</li> </ul>  | <ul style="list-style-type: none"> <li>• Curiosity</li> <li>• Desire to try something new</li> <li>• Fun and enjoyment</li> </ul>   |
| <b>Informational Issues</b>            | <ul style="list-style-type: none"> <li>• Lack of adequate knowledge or explanation</li> <li>• Preconceived notions</li> <li>• Stereotypes</li> </ul>  | <ul style="list-style-type: none"> <li>• Provision of accurate information</li> <li>• Explanation of potential benefits</li> <li>• Clarification of potential misconceptions</li> <li>• Positive testimonials</li> <li>• Observing a class or seeing a demonstration</li> </ul> |
| <b>Practical Issues</b>                | <ul style="list-style-type: none"> <li>• Time constraints</li> <li>• Financial limitations</li> <li>• Transportation difficulties</li> <li>• Lack of accessibility</li> </ul>                               | <ul style="list-style-type: none"> <li>• Free class</li> <li>• Incentive for going</li> <li>• Convenient</li> <li>• Positive class environment</li> </ul>   |
| <b>Social Issues</b>                   | <ul style="list-style-type: none"> <li>• None</li> </ul>  | <ul style="list-style-type: none"> <li>• Recommendation from a friend</li> <li>• Having a friend to go with</li> </ul>  |