

**THE ROLE OF PRAYER IN RACE DIFFERENCES
IN PAIN SENSITIVITY**

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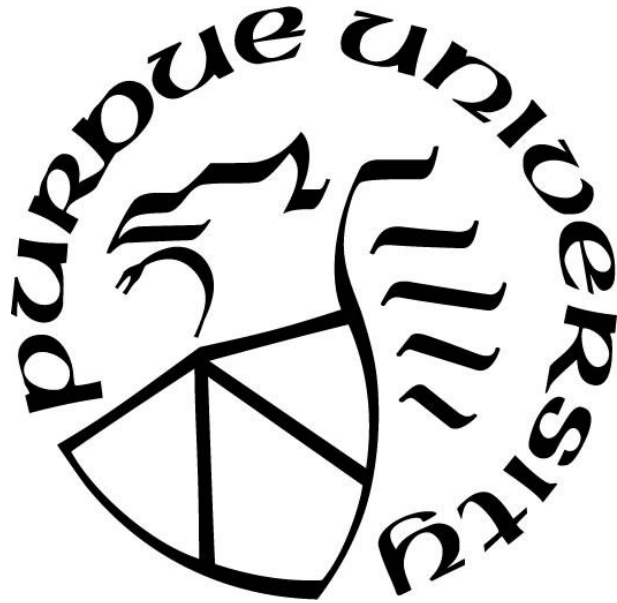
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A Dissertation

Submitted to the Faculty of Purdue University

In Partial Fulfillment of the Requirements for the degree of

Doctor of Philosophy



Department of Psychological Sciences

Indianapolis, Indiana

August 2017

THE PURDUE UNIVERSITY GRADUATE SCHOOL
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ACKNOWLEDGMENTS

I would like to thank my mentor and committee chair, Dr. Adam Hirsh, for his guidance and support throughout this process. Thank you also to my committee members, Drs. Catherine Mosher, Kevin Rand, and Leslie Ashburn-Nardo for their expertise and feedback. Thanks to Madison Stout, Samuel Abplanalp, David Wuest, and Kayla Jackson for their assistance with data collection. Additionally, my sincerest gratitude to the Indiana University-Purdue University Indianapolis Department of Psychology for its financial support for this project.

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ABSTRACT

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Degree Received: August 2017
Title: The Role of Prayer in Race Differences in Pain Sensitivity
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Compared to White individuals, Black individuals demonstrate a lower tolerance for experimental pain. Previous studies also suggest that prayer mediates the race difference in pain tolerance such that Black individuals pray more than White individuals with praying being associated with decreased pain tolerance. However, prayer as it has been studied in relation to pain is a passive coping strategy. Therefore, it is unclear whether prayer in and of itself is driving this relationship or whether it is due to the passive nature of the prayer. The purpose of the current study was to examine the interaction between prayer and race on experimental pain tolerance. Healthy undergraduates were randomly assigned to one of three prayer groups: active prayer, passive prayer, and no prayer. Participants were instructed to continually repeat a specified prayer while undergoing a cold pressor task measuring pain tolerance. Results of a 2 (Race: White vs. Black) X 3 (Prayer: active vs. passive vs. none) between-subjects ANOVA indicated there were no significant main effects of race [$F(1,202) = 1.01$; $p = .32$] or prayer [$F(2,202) = 1.99$; $p = .14$] on tolerance and no race X prayer interaction [$F(2,202) = .37$; $p = .69$]. However, a visual inspection of the means trended in the expected direction with those engaged in active prayer demonstrating longer tolerance ($M = 53.77$; $SD = 49.96$) than those engaged in passive prayer ($M = 40.94$; $SD = 36.11$) and no prayer ($M = 41.63$; $SD = 40.84$). These results suggest that the nature of prayer may

influence its effect on pain outcomes. This is consistent with the literature which suggest that, compared to passive strategies, active coping strategies are associated with improved pain outcomes. These results may inform psychosocial pain treatments, especially for individuals who endorse the use of prayer as a coping strategy. Providers may consider encouraging patients to adopt a more active style of prayer in order to facilitate pain self-management.

INTRODUCTION

Pain is a public health concern affecting approximately 100 million Americans and is associated with \$635 billion in annual medical treatment and lost productivity (Institute of Medicine, 2011). The pain experience varies based on race and ethnicity. Compared to Caucasians, Black individuals have reported higher levels of pain for a number of conditions including: AIDS, glaucoma, arthritis, post-operative pain, post-spinal fusion pain, and low back pain (Breitbart, McDonald, Rosenfeld, & Passik, 1996; Creamer, Lethbridge-Cejku, & Hochberg, 1999; Faucett, Gordon, & Levine, 1994; Selim, Fincke, Ren, Deyo, & Lee, 2001; Sherwood, Garcia-Siekavizza, & Meltzer, 1998; White, Asher, Lai, & Burton, 1999). In addition to being more sensitive to clinical pain, Black individuals demonstrate a lower pain tolerance and report higher pain intensity and unpleasantness during experimental pain tasks than do non-Hispanic Whites (Campbell, Edwards, & Fillingim, 2005; Chapman & Jones, 1944; Edwards, Fillingim, & Keefe, 2001; Fillingim, Edwards, & Powell, 1999; Meints & Hirsh, 2015; Rahim-Williams et al., 2007; Sheffield, Biles, Orom, & Maixner, 2000; Walsh, Schoenfeld, & Ramamurthy, 1989; Woodrow, Friedman, & Siegelau, 1972).

Race differences in pain sensitivity may be due to differences in a number of psychosocial factors such as pain related coping. Broadly defined, coping is the use of behavioral and cognitive techniques to manage stress (Lazarus & Folkman, 1984). Pain related coping has been associated with pain intensity, adjustment to chronic pain, and psychological and physical functioning (Jensen & Karoly, 1991; Jensen, Turner, & Romano, 1991; Keefe & Williams, 1990; Turner & Chapman, 1982). For example, ignoring pain is associated with less pain and improved psychological functioning,

whereas praying/hoping, catastrophizing, and diverting attention are associated with more pain and depression and poorer psychological functioning (Edwards, Campbell, & Fillingim, 2005; Jensen & Karoly, 1991; Jordan, Lumley, & Leisen, 1998; Keefe & Williams, 1990; Rosenstiel & Keefe, 1983).

A recent meta-analysis found race differences in the use of pain related coping strategies, with Black individuals engaging in hoping/praying, catastrophizing, diverting attention, reinterpreting pain, exercising/stretching, and increasing behavioral activity more than White individuals (Meints, Miller, & Hirsh, 2016). The largest race differences among these strategies were in hoping/praying and catastrophizing; the differential use of these strategies may mediate the race differences in pain sensitivity. Results of previous studies examining the relationships among catastrophizing, race, and pain (Chibnall & Tait, 2005; Forsythe, Thorn, Day, & Shelby, 2011; Meints, Stout, Abplanalp, & Hirsh, 2017) suggest that catastrophizing partially accounts for race differences in pain perception. Less is known, however, about the relationships among praying, race, and pain sensitivity.

Although several studies examined the relationships between two of these variables (Andersson, 2008; Dozois, Dobson, Wong, Hughes, & Long, 1996; Edwards et al., 2001; Jones, Kwoh, Groeneveld, & Mor, 2008), to my knowledge, only one study (Meints & Hirsh, 2015) has examined the relationships between all three. Results of this study suggest that hoping and praying mediated the race differences in cold pain tolerance among healthy adults. Specifically, Black individuals used hope/prayer strategies more than White individuals, and this difference partially accounted for the race difference in pain tolerance (Meints & Hirsh, 2015).

However, because this study was correlational in nature, it could not answer questions about causality or directionality. It remains unknown whether praying itself leads to increased pain sensitivity or whether differences in praying account for the race differences observed in pain sensitivity. An experimental study in which praying is manipulated would allow for stronger conclusions about the directionality of this relationship. To my knowledge, no studies have manipulated praying to experimentally test its causal role in the relationship between race and pain sensitivity.

Another important limitation of the current pain coping literature is related to the conceptualization and measurement of praying as a coping strategy. Coping strategies can be classified as either active or passive in nature. Active coping strategies, which involve attempting to control pain or function in spite of pain, are related to less pain, depression, and functional impairment and to higher self-efficacy (Brown & Nicassio, 1987). In contrast, passive coping is characterized by relinquishing control of pain to others and allowing other areas of life to be adversely affected by pain (Brown & Nicassio, 1987). Although there are several types of prayer (Bänziger, Uden, & Janssen, 2008), many of the studies examining praying in the context of pain have used the Coping Strategies Questionnaire (CSQ; Rosenstiel & Keefe, 1983), which conceptualizes praying as a passive strategy (e.g., "I pray for the pain to stop;" Ashby & Lenhart, 1994). Previous research suggests that passive coping, including passive prayer, is related to worse pain and functioning and to increased rates of disability (Beckham, Keefe, Caldwell, & Roodman, 1992; Brown & Nicassio, 1987; Keefe & Dolan, 1986; Mercado, Carroll, Cassidy, & Côté, 2005; Parker, Smarr, & Buescher, 1989; Vlaeyen & Linton, 2000).

Unlike passive prayer which asks for a higher power to control or eliminate pain, active prayer involves asking a higher power to help individuals manage their own pain or to function despite their pain (e.g., “I pray for the strength to endure the pain,”). To my knowledge, however, no studies have examined the impact of active prayer on pain related outcomes. Further, the differential role of active versus passive prayer in explaining race differences in pain has not been explored.

In the current study, I examined the influence of prayer, both active and passive, on the relationship between race and experimental pain sensitivity. Black and White participants were randomly assigned to an active prayer, passive prayer, or no prayer control group. Participants completed a cold pressor pain task while repeating an active prayer statement, passive prayer statement, or neutral (no prayer) statement. I hypothesized that (1) consistent with previous studies, Black participants would demonstrate a lower tolerance for cold pain than White participants, (2) participants (of both races) engaging in passive prayer would have a lower pain tolerance than those engaging in active or no prayer, and (3) there would be an interaction between prayer type and race on pain tolerance, such that Black participants engaging in passive prayer would have the lowest pain tolerance while White participants engaging in active prayer would have the highest pain tolerance.

METHODS

Participants

Participants were 208 healthy undergraduate students within the Psychology Department from Indiana University-Purdue University Indianapolis (IUPUI), a public Midwestern University. Participants were recruited using the SONA system, which allows students to participate in research studies for course credit. An a priori statistical power analysis (G*Power 3.1.5) was performed to estimate the sample size needed for this study. These estimates were based on data from the Meints & Hirsh (2015) study examining race differences in pain tolerance, as it provided the most relevant data for the proposed study. The mean effect size for the main effect of race on pain tolerance in that study was large ($d = 0.69$). With an alpha = 0.05 and power = 0.80, the projected sample size needed to test the main hypotheses is approximately 82. I also performed a second power analysis using a more conservative effect size ($d = 0.50$) and found a projected sample size of 158. Thus, my sample of 208 participants should provide adequate power for these analyses.

Measures

Pain Coping

The Coping Strategies Questionnaire-Revised (CSQ-R) is a 27-item self-report measure of pain-related coping (Riley & Robinson, 1997) (see Appendix 1). It consists of 6 cognitive coping strategies (diverting attention, reinterpreting pain sensations, coping self-statements, ignoring pain sensations, praying/hoping, and catastrophizing) that were retained from the original CSQ. Participants rate how often they used each strategy to

cope with pain from 0 (never do that) to 6 (always do that). The CSQ-R has a more refined factor structure than the original CSQ, with subscale reliability ranging from .72-.86 (Hastie et al., 2004; Riley & Robinson, 1997). The 6-factor structure reported by Hastie, Riley & Fillingim was retained in this sample with good overall ($\alpha = 0.87$) and subscale (range of $\alpha = 0.80-0.91$) reliability.

Religious Coping

The Religious and Spiritual Coping Scale-Short Form (RSCS-SF; Keefe, Affleck, Lefebvre, & Underwood, 2001) is a 15-item self-report measure of religious and spiritual coping with pain, as well as daily religious and spiritual experiences (See Appendix 2). The measure includes 4 subscales: (1) positive religious/spiritual coping (“I worked together with God as partners,”), (2) negative religious/spiritual coping (“I wondered whether God has abandoned me,”), (3) perceived salience and efficacy of religious coping (“To what extent did religious or spiritual coping allow me to control my pain?”), and (4) religious and spiritual experiences (“I felt God’s presence,”). Participants use a 4-point scale to rate the frequency with which they engage in each coping strategy, the salience of the religious coping, and the frequency with which they have religious and spiritual experiences. The scale has adequate reliability ($\alpha = 0.67$).

Religiosity

The Duke University Religion Index (DUREL) (Koenig & Büssing, 2010) is a 5-item self-report measure of religious involvement (See Appendix 3). The measure assesses three dimensions of religiosity: organized religious activity (e.g., attending church services), non-organizational religious activity (e.g., prayer), and intrinsic religiosity (“In my life, I experience the presence of the Divine,”). Participants first use a

6-point scale to rate the frequency with which they engage in organized and unorganized religious activities. They then use a 5-point scale to rate the extent to which 3 statements describing their intrinsic religiosity are true. The overall scale has good overall reliability ($\alpha = 0.80$).

Locus of Control

The Multidimensional Health Locus of Control scale (Wallston & Wallston, 1978) is an 18-item self-report measure of internal and external locus of control for health-related behaviors and outcomes (see Appendix 4). The measure includes three subscales: (1) internal health locus of control (“I am in control of my health,”), (2) powerful others health locus of control (“Health professionals control my health,”), and (3) chance health locus of control (“No matter what I do, if I am going to get sick, I will get sick,”). Participants rated their agreement with each statement using a 6-point Likert-type scale ranging from 1 (strongly disagree) to 6 (strongly agree). The scale had acceptable overall reliability ($\alpha = 0.72$) and subscale reliability in this sample (range of $\alpha = 0.63-0.68$).

The Spiritual Health Locus of Control scale (Holt, Clark, & Klem, 2007) is a 13-item self-report measure of spiritual health locus of control beliefs (see Appendix 5). This scale is comprised of 4 subscales: (1) spiritual life and faith (“Prayer is the most important thing I do to stay healthy,”), (2) God’s grace (“Through my faith in God, I can stay healthy,”), (3) passive spiritual (“There is no point in taking care of myself when it is all up to God anyway,”), and (4) active spiritual (“God gives me the strength to take care of myself,”). Participants rated their agreement with each statement using a 4-point Likert-type scale ranging from 1 (strongly disagree) to 4 (strongly agree). The scale had

good overall reliability ($\alpha = 0.80$) though the subscale reliability ranged from questionable (passive spiritual subscale, $\alpha = 0.62$) to good (life faith subscale, $\alpha = 0.80$) within this sample.

Pain Tolerance

Pain tolerance was measured as the total number of seconds elapsed at the time of withdrawal from the cold pressor. Cold pain tolerance has strong reliability and validity and demonstrated relevance to clinical pain (Chapman et al., 1985; Edens & Gil, 1995; Gelfand & Sidney, 1964; Rainville, Feine, Bushnell, & Duncan, 1992; Wolff, 1984).

Procedures

Students interested in participating in the study were contacted via telephone to answer a number of health-related questions and determine study eligibility. Participants were excluded if they have chronic pain, circulatory problems, hypertension, diabetes, heart or vascular disease, a history of fainting spells, a seizure disorder, Raynaud's Disease, Sick Cell Anemia, are pregnant, under psychiatric care, have had an allergic skin reaction or excessive bruising, have participated in a cold pressor pain experiment before, have had frostbite on their non-dominant hand, or have recently sprained or fractured their wrist or hand. Participants were also excluded if they did not endorse belief in the power of prayer (e.g. "Do you believe in the power of prayer?"). Eligible participants were scheduled to complete the study individually in a laboratory at Indiana University–Purdue University Indianapolis. Upon arrival, participants provided informed consent to participate. Next, they completed a questionnaire to rule out use of analgesic medications within the past 24 hours, consumption of caffeine and alcohol within the last 2 hours, or use of tobacco products within the last 2 hours. Participants who used analgesic

medications or tobacco or who consumed caffeine or alcohol were rescheduled. Participants were then randomly assigned to one of three groups: active prayer, passive prayer, and no prayer. During the testing session, participants completed computerized questionnaires using the Qualtrics online platform that included a demographic questionnaire, CSQ-R (Riley & Robinson, 1997), the Religious and Spiritual Coping Strategies Questionnaire (Keefe et al., 2001), the DUREL (Koenig & Büssing, 2010), the Multidimensional Health Locus of Control Scale (Wallston & Wallston, 1978), and the Spiritual Health Locus of Control Scale (Holt, Clark, & Klem, 2007). They also completed a cold pressor pain task (CPT). During the CPT, participants were asked to submerge their non-dominant hand up to their wrist in a circulating bath of 2⁰ C water (Thermo Scientific Arctic Series Refrigerated Bath Circulator; Thermo Scientific, Waltham, MA). They were instructed to leave their hand in the water until they could no longer tolerate the sensation. When the participants were no longer able to tolerate the sensation, they were asked to say “pain limit” and remove their hand from the water. Participants who had not reached pain tolerance after three minutes were asked to remove their hand from the water. While participants’ hands were submerged, they were asked to repeat one of three phrases over and over again aloud. The order of completion of the questionnaires and pain task was counterbalanced to prevent order effects. At the end of the study, participants were debriefed and compensated with class credit.

Prayer Manipulation

Participants in the passive prayer group repeated the phrase, “God, take the pain away.” This statement was modified from the item “I pray for the pain to stop,” which had the highest loading on the prayer factor for the Coping Strategies Questionnaire-

Revised (Riley & Robinson, 1997). Participants in the active prayer group repeated the phrase, “God, help me endure the pain.” This statement was modified from the item “I looked to God for strength, support, and guidance,” which had a high factor loading (.62) on the Religious Coping Scale (RCOPE; Pargament & Koenig, 2000). For the current study, I modified the item to be shorter in length and more pain-specific, while still active in nature. Participants in the no prayer group repeated the phrase, “The sky is blue,” during the CPT. This phrase was used for the control condition in a similar previous study that manipulated catastrophizing during an experimental CPT procedure (Bialosky, Hirsh, & Robinson, 2008).

Data Analysis

Independent samples t-tests were used to examine race differences in psychosocial variables. I used a more stringent alpha of .01 to reduce the possibility of Type I error given the multitude of analyses. I then conducted a 2 (race: Black vs. White) X 3 (praying: active vs. passive vs. no prayer) ANOVA examining the main effects of race and praying and the interaction between race and praying on pain tolerance. I conducted post-hoc analyses to identify significant differences between prayer conditions using a Bonferroni adjusted alpha level of .016 (.05/3).

In addition to the above planned analyses, I also conducted 2 (race: Black vs. White) X 3 (praying: active vs. passive vs. no prayer) ANCOVAs examining the main effects of race and praying and the interaction between race and praying on pain tolerance while controlling for the following psychosocial variables: praying as a pain coping strategy (CSQ-R Hoping/Praying subscale), perceived efficacy of prayer as a pain coping strategy (RSCS-SF Perceived Efficacy of Prayer subscale), and locus of control for

powerful others (MHLOC Powerful Others subscale). These psychosocial variables were included as covariates for two reasons. First, there were significant race differences for these variables in the current sample. Second, these variables have been shown to be related to pain outcomes in previous studies. Praying, as measured by the CSQ-R, is not only associated with lower pain tolerance but has been found to mediate race differences in experimental cold pain tolerance (Meints & Hirsh, 2015). Increased perceived efficacy for spiritual and religious coping is associated with less pain for individuals with RA (Keefe et al., 2001). Likewise, increased locus of control for powerful others (e.g., doctors) is associated with increased pain (Wallston & Wallston, 1978). Although significant race differences emerged for three other psychosocial variables (i.e., RSCS-SF perceived salience of spiritual and religious coping, SHLOC Spiritual Life and God's Grace), they were not included as covariates because they have not been shown to be related to pain outcomes.

Missing Data

Of the 208 participants, there was one missing data point for race. Seven percent of the sample did not provide their age ($N = 14$), .5% did not provide their sex ($N = 1$), and 1% did not provide their religious affiliation ($N = 2$). As the missing data was minimal, I used pairwise deletion for all analyses including these variables.

For the CSQ-R, missing data ranged from 3% to 55% for each item. There was limited missing data for the DUREL with less than 1% missing for each item. Missing data for the Religious and Spiritual Coping Strategies Questionnaire, Multidimensional Health Locus of Control Scale, and the Spiritual Health Locus of Control Scale were similar, ranging from 4-33%, 2-32%, and 1-34%, respectively. A review of the

formatting for the Qualtrics surveys revealed that the starting position for the slider on each item was positioned directly beneath the lowest anchor for that item. Thus, participants likely intended missing responses to correspond to the lowest anchor for each item, however they may not have realized that they needed to click on the slider or move it in order for it to register their responses. Furthermore, an inspection of the data demonstrated that participants with missing data points did not respond to other items with the lowest anchored response, further suggesting that participants with missing data intended missing responses to correspond with the lowest anchor point for each item rather than simply skipping the item. Thus, for the remainder of the psychosocial variables, I imputed missing data with values corresponding to the lowest anchor for each item. For a sensitivity analysis, I also tested two other imputation methods: pairwise deletion and mean imputation. Results of the primary analyses were consistent regardless of data imputation method. Results for these additional analyses can be found in the tables in Appendices 6 & 7.

RESULTS

Participant Characteristics

The sample consisted of 208 participants (79.9% female, 46.9% Black, 96% Christian). The distribution of sex did not differ significantly between races [$\chi^2(1, N = 208) = .06, p = .81$]. The distribution of religious affiliation also did not differ significantly between races [$\chi^2(3, N = 208) = 4.72, p = .19$]. The mean age for the Black (20.41 years, $SD = 4.74$) and White (19.89 years, $SD = 3.61$) participants did not significantly differ ($t_{192} = .88, p = .38$).

Race Differences in Psychosocial Variables

The results of independent samples t-tests (see Table 1) indicated that, compared to White participants, Black participants scored significantly higher on the CSQ-R praying/hoping subscale ($p < .01$), thus, endorsing that they use prayer more frequently in response to pain. Regarding religious coping in response to pain, White participants endorsed greater perceived salience or importance of religion and spirituality in their life than Black participants ($p < .01$). On the other hand, Black participants reported greater perceived efficacy of religious coping on improving pain ($p < .01$). Compared to Black participants, White participants identified a greater external locus of control for their health, specifically, a greater powerful others locus of control ($p < .01$). Black participants, however, were more likely to endorse beliefs that their spiritual life and faith ($p < .01$) as well as God's grace ($p < .01$) influence their health.

Analysis of Variance

Results of a 2 (race) X 3 (prayer) analysis of variance (ANOVA) indicated no significant main effect of race ($F_{1,202} = 1.01, p = .32$) or prayer ($F_{2,202} = 1.99, p = .14$) on pain tolerance (see Tables 2 & 3, Figure 1). There was also no significant race x prayer interaction ($F_{2,202} = .37, p = .69$). Despite these non-significant findings, the pattern of means for the effect of prayer were in the expected direction, with those in the active

prayer group having the highest pain tolerance and those in the passive prayer group having the lowest pain tolerance. Thus, I conducted a series of pairwise comparisons to explore any differences between prayer conditions (see Table 4). Results indicated that those in the active prayer group demonstrated a longer pain tolerance – specifically, they kept their hand in the water approximately 12 seconds longer – than those in the passive prayer group ($t_{130.91} = 1.79$, $p = .07$) and the no prayer group ($t_{131} = 1.51$, $p = .12$), although these results failed to reach statistical significance. There was minimal (less than 1 second) and no significant difference between the passive prayer and no prayer groups ($t_{133} = -0.10$, $p = .88$). Furthermore, although there was not a significant race by prayer interaction, an inspection of the means indicated that Black participants in the passive prayer group demonstrated the lowest tolerance ($M = 34.51$, $SD = 33.77$) while White participants in the active prayer group demonstrated the greatest tolerance ($M = 56.83$, $SD = 51.65$).

Analysis of Covariance

Results of a 2 (race) X 3 (prayer) analysis of covariance (ANCOVA) controlling for three baseline psychosocial variables – prayer as a usual strategy for coping with pain (CSQ-R), locus of control in powerful others (MHLOC), and perceived efficacy for religious and spiritual coping with pain (RSCS-SF) – indicated a nearly significant main effect of race such that White participants (Estimated Marginal Mean [EMM] = 51.16, $SE = 4.17$) demonstrated a longer cold pain tolerance than Black participants (EMM = 38.81, $SE = 4.48$; $F_{1,200} = 3.79$, $p = .05$, $\eta^2 = .02$); the effect size for this finding was small (see Table 5). There was also a trend for the main effect of prayer ($F_{2,200} = 2.45$, $p = .09$, $\eta^2 = .02$). Pairwise comparisons indicated that participants in the active prayer group

(EMM = 53.96, SE = 4.97) demonstrated a longer cold pain tolerance than those in the passive prayer group (EMM = 39.78, SE = 39.78; $p = .05$) and those in the no prayer group (EMM = 41.20, SE = 5.45; $p = .09$; see Table 6). There were no differences observed between the passive and no prayer groups ($p = .85$). Additionally, there was no race X prayer interaction (see Tables 5 & 7).

DISCUSSION

The purpose of this study was to examine the influence of prayer on the relationship between race and experimental pain tolerance. I hypothesized that (1) Black participants would demonstrate a lower tolerance for cold pain, (2) participants engaged in passive prayer would have a lower pain tolerance than those engaged in active or no prayer, and (3) there would be an interaction between prayer type and race on pain tolerance, such that Black participants engaging in passive prayer would have the lowest pain tolerance while White participants engaging in active prayer would have the highest pain tolerance. Contrary to my hypotheses, results of the primary analyses indicated there were no significant race differences in pain tolerance. Likewise, there was no significant interaction between race and type of prayer, however an inspection of the means was in the expected direction with Black participants in the passive prayer group demonstrating the lowest tolerance and White participants in the active prayer group demonstrating the highest tolerance. Although the effect of prayer did not reach statistical significance, there was a trend in the hypothesized direction with those in the active prayer condition demonstrating a longer tolerance than those in the passive and no prayer conditions.

It is not surprising that those in the active prayer condition demonstrated a greater pain tolerance than those in the passive prayer condition. Passive coping is associated with avoidance and related to worse pain and functioning (Bade & Cook, 2008; Breitbart et al., 1996; Brown, Nicassio, & Wallston, 1989; Mercado et al., 2005; Parker et al., 1989; Vlaeyen & Linton, 2000). As proposed in the Fear-Avoidance Model, a fearful appraisal of and emotional reaction to pain can lead to both cognitive and behavioral avoidance (i.e., praying for pain to subside as well as avoiding painful activities)

(Melzack & Dennis, 1978). Thus, the passive nature of prayer may perpetuate cognitive and behavioral avoidance contributing to poor pain outcomes and in this case, decreased pain tolerance.

However, rather than passive prayer being related to poorer pain outcomes, it is possible that active prayer leads to improved pain and related outcomes. Indeed, participants in the active prayer condition kept their hands in the water for 12 seconds or approximately 30% longer than those in the passive prayer condition, and 11 seconds or approximately 26% longer than those in the no prayer condition. On the other hand, tolerance for the passive and no prayer groups differed only minimally, by less than 1 second, which suggests that, rather than passive prayer leading to poorer pain tolerance, active prayer actually resulted in *greater* tolerance, especially for White participants. Although inconsistent with Geisser and colleagues' (1999) findings suggesting "maladaptive" coping has a greater impact on pain outcomes than does "adaptive" coping, this pattern is consistent with literature that suggests prayer is perceived to be a helpful coping strategy for general stress (Spilka, Hood, Hunsberger, & Gorsuch, 2003). Further evidence indicates that religious-based strategies are related to favorable health outcomes for a number of populations. Specifically, prayer is related to increased success of in-vitro fertilization, decreased length of hospital stay and duration of fever in septic patients, increased immune function, improved rheumatoid arthritis, and less anxiety and adverse outcomes in heart disease (Çoruh, Ayele, Pugh, & Mulligan, 2005).

Despite the apparent benefit of engaging in active prayer across both White and Black participants, the impact of active versus passive prayer on pain tolerance seemed to vary by race. While White participants in the active prayer condition demonstrated the

highest pain tolerance, Black participants in the passive prayer condition demonstrated the lowest tolerance. This suggests that active and passive coping may have a different impact on pain outcomes based on race. That is, passive coping (i.e. passive prayer) may be of greater detriment for Black individuals compared to Whites while an active strategy (i.e. active prayer) was most beneficial for White participants. Future studies should aim to better elucidate race differences in the relationship between active and passive coping and pain outcomes.

Active prayer may facilitate self-management of pain (i.e., asking God for support in managing one's pain). Self-management is considered a key aspect of chronic pain care and is associated with better outcomes including lower health care costs and higher patient satisfaction ratings (Cedraschi, Desmeules, & Rapiti, 2004; Lorig & Mazonson, 1993; Von Korff, Barlow, & Cherkin, 1994). Indeed, many evidence-based psychosocial treatments, such as Cognitive Behavioral Therapy and acceptance-based approaches, specifically focus on enhancing patients' self-management efficacy and skills. Active prayer that solicits God's support in managing one's pain fits nicely in this context and may lead to positive pain outcomes.

Practitioners may also consider adapting psychosocial interventions to target prayer in order to tailor treatments for individuals who endorse the use of religion and prayer as a way to cope with pain. Cognitive Behavioral Therapy (CBT), which is the gold standard psychosocial intervention for chronic pain, employs cognitive restructuring and behavioral techniques (e.g. operant learning, behavioral activation, activity pacing) to enhance functioning and psychological well-being while improving quality of life. Indeed, CBT has a strong evidence base for reducing pain and improving physical

function (Morley, Eccleston, & Williams, 1999). By using CBT principles, practitioners may help enhance patients' coping skills by accounting for their natural predilections and preferences and teaching them new ways to use prayer more actively. This would allow providers to incorporate patients' religious beliefs and preferences, and to draw on their faith and relationship with God in order to promote active, self-management of pain.

Active prayer may also take the form of meditative practice. Meditation, which involves consciously focusing attention in a non-analytical way while avoiding the tendency to ruminate or think discursively (Shapiro, 1994), has been shown to consistently improve pain across various chronic pain conditions (Hilton, Hempel, Ewing, & Apaydin, 2017). In active prayer, individuals may focus attention on living with pain (e.g., "God, help me make it to my son's game despite this pain,") rather than hoping for pain elimination, consistent with a passive style of prayer such as that measured by the CSQ-R (Robinson et al., 1997). Practitioners may tailor mindfulness-meditation based interventions for pain to incorporate active prayer as a form of mindfulness practice for those patients who identify religion and prayer as a means of coping with pain.

An Acceptance and Commitment Therapy (ACT) approach may be advantageous as well. ACT helps patients accept their experiences, alter their relationship with private events such as pain, be present, and engage in committed action that aligns with their values. ACT is effective in reducing pain and related depression in those with chronic pain (Veehof, Oskam, Schreurs, & Bohlmeijer, 2011). The core principles of ACT are consistent with the notion of living a meaningful life and thriving with pain. Thus, for patients who find prayer to be an important way to cope with pain, providers may utilize

prayer within an ACT framework to help patients build acceptance, be present with their pain rather than avoid it, and engage in committed action despite ongoing pain. For example, prayer may be adapted to ask God for help living a life of meaning by being more active and involved in their children's lives rather than asking for pain elimination.

Despite consistent evidence indicating that Black individuals demonstrate lower tolerance for experimental pain than do White individuals (Edwards, Moric, Husfeldt, Buvanendran, & Ivankovich, 2005; Meints et al., 2016; Meints et al., 2016; Tan, Jensen, Thornby, & Anderson, 2005), no race differences were found in the current study. This finding may be due to the exclusion of potential participants who did not believe in the power of prayer. As Black individuals tend to be more religious than White individuals (Chibnall & Tait, 2005), it is likely there were more White than Black non-believers excluded from the study. The exclusion of White non-believers may have impacted the mean tolerance time for the White sample in this study. Indeed, mean tolerance times for this study differ from previous experimental cold-pain tolerance times. For example, Meints & Hirsh (2015) found that Black individuals tolerated cold pain for approximately 49 seconds while White individuals tolerated pain for 80 seconds. In the current study, a similar pattern emerged for Black participants ($m = 42$ seconds), whereas White participants demonstrated a much lower tolerance ($m = 49$ seconds). Despite an abundance of evidence suggesting Black individuals are more likely to endorse religious coping (Chatters, Taylor, & Jackson, 2008; Dunn & Horgas, 2000; Mansfield, Mitchell, & King, 2002; McAuley, Pecchioni, & Grant, 2000), compared to Black participants, White participants in the current study endorsed a stronger belief in the salience of religion in coping with pain (e.g., religion is involved in my ability to understand and

deal with my pain). Thus, the difference in pain tolerance between White participants in the current study compared with those in a previous study may be accounted for by differences in religious coping between White believers and non-believers. Future studies should examine the association between race, religious coping and prayer, and pain in both non-believers and believers to better elucidate these relationships.

Several limitations should be considered when interpreting these findings. First, because participants were pain-free, these results may not generalize to individuals coping with chronic pain conditions. Additionally, although I observed differences in pain tolerance between prayer conditions, these differences did not reach statistical significance. Because a robust estimated effect size was used in a priori power analyses (i.e. $d = .50$), it is possible the study was underpowered to identify true differences across prayer conditions. Further, the manipulation used for this experiment may not have been salient enough and thus did not produce a meaningful effect. For example, in the passive prayer condition, participants asked God to take away the pain. Because participants understood that the pain would end upon them removing their hand from the water, this manipulation may not have been well-targeted. It is also possible that participants did not view the phrase they repeated as a prayer. Prior to the pain task, participants were instructed to repeat a phrase, not a prayer per se. Furthermore, these phrases were not individually tailored to match participants' style or phrasing of prayer and thus may have been less meaningful. Future studies should consider using prayer statements that are personally meaningful for participants. For example, researchers could generate a list of prayer statements and ask participants to choose the statement(s) that most resonates with

them. Alternatively, participants may generate a list of meaningful prayers that can then be adapted for the pain task.

The potentially limited salience of this phrasing may have caused the manipulation to be more consistent with a distraction technique or other coping strategy rather than a prayer. Indeed, evidence suggests distraction reduces pain (McCaul & Malott, 1984). However, mean differences between prayer conditions were in the expected direction, suggesting a small but noticeable effect of prayer rather than just distraction. Further, according to capacity theory (Kahneman, 1973), a distractor that maximizes attentional demand is most effective. The phrases used by participants were brief (ranging from 4 to 6 words) and likely not attentionally demanding. Johnson (1997) suggests that asking participants to identify when a pain sensation becomes intolerable is paradoxical to asking them to attend to an alternative stimulus such as a prayer. That is, a participant repeating a prayer during a pain task must also attend to the painful stimulus in order to identify when this stimulus becomes intolerable. Thus, participants were likely attending to the pain, in some capacity, rather than fully attending to the prayer or phrase they repeated, again weakening the salience of that prayer/phrase. Because pain demands attention and is likely attentionally prioritized over prayer, future studies may have participants start praying prior to submerging their hand in the cold water in order for them to become more immersed in the prayer.

Although there were no race differences in religious affiliation in the current sample, with the majority of the sample endorsing Christianity, there may have been denominational differences. Indeed, a survey of religion in the United States indicated that while 78% of White and 85% of Black individuals endorse Christianity, 78% of

Blacks are Protestant while only 53% of Whites endorse a Protestant denomination (Lugo et al., 2008). On the other hand, 22% of Whites identify as Catholic compared to only 5% of Blacks. Given the differences in denomination, future studies should consider not only religious affiliation but also denominational differences when examining the relationship between religious coping, race, and pain.

Despite these limitations, results of this study suggest the need for a more nuanced understanding of prayer and how it impacts pain outcomes. Prayer, in and of itself, is neither adaptive nor maladaptive. However passive prayer, like other passive coping strategies, may be related to decreased pain tolerance and thus poorer pain outcomes, especially for Black individuals. This lends support to the notion that the passive nature of prayer, rather than prayer in and of itself, may be driving race differences observed in experimental pain tolerance. That is, Black individuals more frequently endorse the use of passive prayer to cope with pain (Meints & Hirsh, 2015; Meints et al., 2016) and this passive prayer is associated with lower pain tolerance, particularly for Black individuals. On the other hand, results suggest active prayer is associated with greater pain tolerance, especially for White individuals and may facilitate self-management of pain. These results suggest that psychosocial interventions may be used to help individuals who use religion and prayer to cope with pain engage in a more active style of prayer. Additional research is needed to identify the impact of different types of prayer on pain outcomes, especially in chronic pain populations.

TABLES

Table 1. Race Differences in Psychosocial Variables

Variable	Black (N=97)	White (N=110)	T Value	Cohen's D
CSQ-R				
Distraction	14.61(7.64)	14.31(6.37)	0.31	0.04
Catastrophizing	9.33(7.30)	7.56(5.86)	1.91	0.26
Ignoring	11.67(6.16)	13.13(5.94)	-1.74	0.24
Distancing	6.10(5.62)	5.80(5.51)	0.39	0.05
Coping Self Statements	16.94(6.12)	15.37(4.39)	2.11	0.28
Praying	11.95(6.02)	9.76(4.95)	2.85**	0.40
DUREL				
Intrinsic Religiosity	15.36(2.45)	14.89(2.71)	1.29	0.18
Organized Religious Activity	3.86(1.46)	4.10(1.27)	-1.28	0.17
Private Religious Activity	3.45(1.75)	3.35(1.66)	0.47	0.06
MHLOC				
Internal LOC	24.63(4.88)	25.06(4.80)	-0.64	0.10
Chance LOC	17.53(5.13)	18.49(4.74)	-1.41	0.20
Powerful Others LOC	16.32(4.18)	18.37(4.63)	-3.33**	0.48
RSCS-SF				
Positive Religious/Spiritual Coping	5.28(1.86)	5.82(1.99)	-2.04	0.28
Negative Religious/Spiritual Coping	9.45(2.06)	9.90(1.70)	-1.79	0.24
Perceived Salience	1.96(0.82)	2.37(.0.85)	-3.51**	0.51

Table 1 continued

Perceived Efficacy	6.94(2.50)	5.51(2.36)	4.26**	0.59
Religious and Spiritual Experiences	26.71(6.59)	24.96(7.51)	1.78	0.25
SHLOC				
Spiritual Life and Faith	10.64(3.06)	9.04(2.78)	3.96**	0.48
God's Grace	14.42(3.83)	12.79(3.30)	3.30**	0.46
Passive Spiritual	6.15(1.82)	5.82(1.51)	1.44	0.20
Active Spiritual	13.01(2.36)	12.51(1.95)	1.69	0.23

**p<.01

Table 2. Pain Tolerance by Race and Group (in seconds)

	N	Min	Max	Mean	SD
Black					
Active	33	14	180	50.07	48.36
Passive	35	5	180	34.51	33.77
None	29	8.3	180	42.02	45.30
Total	97	5	180	42.05	42.72
White					
Active	40	11.41	180	56.83	51.65
Passive	40	8	180	46.56	37.56
None	31	7.45	180	41.26	36.95
Total	111	7.45	180	48.78	43.13
Total					
Active	73	11.10	180	53.77	49.96
Passive	75	5	180	40.94	36.11
None	60	7.45	180	41.63	40.84

Table 3. ANOVA for Effects of Race and Prayer on Pain Tolerance

	df	F	η^2	p
Race	1	1.01	0.01	0.32
Prayer	2	1.99	0.02	0.14
RaceXPrayer	2	0.37	<.00	0.69
Error	202	1837.23		

Table 4. Prayer Group Differences in Pain Tolerance

	Mean(SD)	T Value	Cohen's D	p
Active vs. Passive				
Active(N=73)	53.77(49.96)	1.79	0.29	0.07
Passive(N=75)	40.94(36.11)			
Active vs. None				
Active(N=73)	53.77(49.96)	1.51	0.27	0.12
None(N=60)	41.63(40.84)			
Passive vs. None				
Passive(N=75)	40.94(36.11)	-0.10	0.02	0.88
None(N=60)	41.63(40.84)			

Table 5. ANCOVA for Effects of Race and Prayer on Pain Tolerance controlling for Psychosocial Factors *

	df	F	η^2	p
Hoping/Praying	1	1.28	0.01	0.26
Powerful Others	1	3.28	0.02	0.07
Efficacy	1	6.63	0.01	0.03
Race	1	3.79	0.02	0.05
Prayer	2	2.42	0.02	0.09
RaceXPrayer	2	0.41	<.01	0.67
Error	201			

*Analysis controlled for CSQ-R Hoping/Praying, MHLOC Powerful Others, and RSCS-SF Efficacy

Table 6. Pairwise Comparisons for ANCOVA

	EMM*	SE	p
Active vs. Passive			
Active	53.96	4.97	0.05
Passive	39.78	4.91	
Active vs. None			
Active	53.96	4.97	0.09
None	41.2	5.45	
Passive vs. None			
Passive	39.78	4.91	0.85
None	41.2	5.45	

*Estimated Marginal Mean

Table 7. Mean Pain Tolerance by Race and Group for ANCOVA Model (in seconds)

	EMM*	SE
Black		
Active	47.30	7.47
Passive	30.56	7.23
None	38.58	7.95
White		
Active	60.65	6.79
Passive	49.01	6.86
None	43.82	7.61

FIGURES

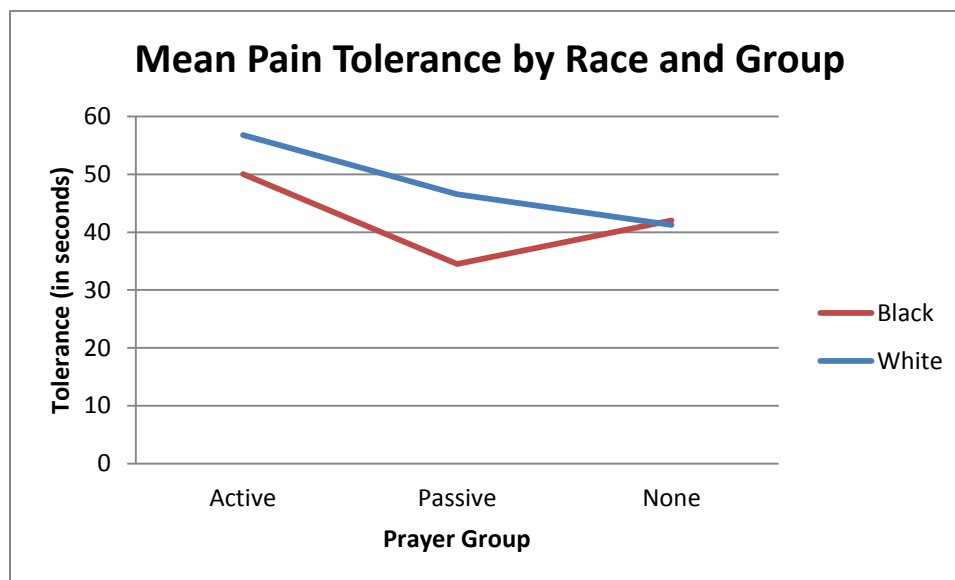


Figure 1. Mean Pain Tolerance by Race and Group

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APPENDIX A. RESULTS TABLES FOR MEAN IMPUTATION ANALYSES

Table 1. Race Differences in Psychosocial Variables (mean imputation method)

Variable	Black			White			T Value
	N	M	SD	N	M	SD	
CSQ-R							
Distraction	98	17.47	5.35	112	15.78	5.24	2.30*
Catastrophizing	98	12.75	5.36	112	10.09	5.01	3.71**
Ignoring	98	14.06	4.72	112	14.18	5.09	-0.18
Distancing	98	8.75	4.37	112	7.73	4.60	1.63
Coping Self Statements	98	18.00	4.39	112	15.74	3.90	3.94**
Praying	98	13.39	4.13	112	10.43	4.39	5.02**
DUREL							
Intrinsic Religiosity	98	15.36	2.45	112	14.87	2.70	1.37
Organized Religious Activity	98	3.86	1.46	112	4.10	1.27	-1.28
Private Religious Activity	98	3.45	1.75	112	3.32	1.62	0.57
MHLOC							
Internal LOC	98	26.82	3.50	112	26.26	3.66	1.14
Chance LOC	98	20.12	3.64	112	19.52	4.22	1.09
Powerful Others LOC	98	18.70	2.90	112	19.24	4.00	-1.14
RSCS-SF							
Positive Religious/Spiritual Coping	98	6.19	1.58	112	6.53	1.69	-1.51
Negative Religious/Spiritual Coping	98	9.97	1.58	112	10.21	1.27	-1.19
Perceived Salience	98	2.22	0.68	112	2.46	0.76	-2.42*
Perceived Efficacy	98	7.16	2.26	112	5.76	2.19	4.56**
Religious and Spiritual Experiences	98	24.51	5.55	112	23.40	6.28	1.34

Table 1 continued

SHLOC							
Spiritual Life and Faith	98	10.84	2.85	112	9.30	2.50	4.12**
God's Grace	98	14.90	3.30	112	13.13	3.00	4.06**
Passive Spiritual	98	6.32	1.58	112	6.10	1.33	1.12
Active Spiritual	98	13.28	1.87	112	12.60	1.72	2.76**

*p<.05

**p<.01

Table 2. Mean Pain Tolerance by Race and Group (in seconds; mean imputation method)

	N	Min	Max	Mean	SD
Black					
Active	33	14	180	50.07	48.36
Passive	35	5	180	34.51	33.77
None	29	8.3	180	42.02	45.30
Total	97	5	180	42.05	42.72
White					
Active	40	11.41	180	56.83	51.65
Passive	40	8	180	46.56	37.56
None	31	7.45	180	41.26	36.95
Total	111	7.45	180	48.78	43.13
Total					
Active	73	11.10	180	53.77	49.96
Passive	75	5	180	40.94	36.11
None	60	7.45	180	41.63	40.84

Table 3. Analysis of Variance for Effects of Race and Prayer on Pain Tolerance (mean imputation method)

	df	F	η^2	p
Race	1	1.01	0.01	0.32
Prayer	2	1.99	0.02	0.14
RaceXPrayer	2	0.37	<.00	0.69
Error	202	1837.23		

Table 4. ANCOVA for Effects of Race and Prayer on Pain Tolerance Controlling for Psychosocial Factors* (mean imputation method)

	df	F	η^2	p
Hoping/Praying	1	2.29	0.01	0.13
Powerful Others	1	3.07	0.02	0.08
Efficacy	1	12.63	0.06	<.01
Race	1	2.90	0.01	0.09
Prayer	2	2.84	0.03	0.06
RaceXPrayer	2	0.41	<.01	0.66
Error	199			

*Analysis controlled for CSQ-R Hoping/Praying, MHLOC Powerful Others, and RSCS-SF Efficacy

Table 5. Pairwise Comparisons for ANCOVA (mean imputation method)

	EMM*	SE	p
Active vs. Passive			
Active	54.62	4.92	0.03
Passive	39.14	4.85	
Active vs. None			
Active	54.62	4.92	0.07
None	41.39	5.38	
Passive vs. None			
Passive	39.14	4.85	0.76
None	41.39	5.38	
Race			
Black	39.70	4.42	0.09
White	50.40	4.12	

Table 6. Mean Pain Tolerance by Race and Group For ANCOVA Model (in seconds; mean imputation method)

		EMM*	SE
Black			
	Active	48.54	7.37
	Passive	30.90	7.13
	None	39.65	7.87
White			
	Active	60.69	6.66
	Passive	47.38	6.78
	None	43.14	7.53

APPENDIX B. RESULTS TABLES FOR PAIRWISE DELETION ANALYSES

Table 1. Race Differences in Psychosocial Variables (pairwise deletion method)

Variable	Black			White			T Value
	N	M	SD	N	M	SD	
CSQ-R							
Distraction	66	18.23	6.00	89	15.85	5.64	2.52*
Catastrophizing	29	12.83	7.15	50	8.86	6.59	2.50*
Ignoring	61	13.69	5.33	90	14.49	5.35	-0.90
Distancing	46	9.52	6.06	70	8.10	5.66	1.29
Coping Self Statements	86	18.64	4.10	105	15.86	3.99	4.73**
Praying	82	13.88	4.29	103	10.41	4.53	5.30**
DUREL							
Intrinsic Religiosity	98	15.36	2.45	111	14.86	2.71	1.37
Organized Religious Activity	98	3.86	1.46	112	4.10	1.27	-1.28
Private Religious Activity	98	3.45	1.75	111	3.32	1.63	0.57
MHLOC							
Internal LOC	47	27.45	3.72	80	26.75	3.73	1.02
Chance LOC	53	19.91	4.47	85	19.36	4.57	0.68
Powerful Others LOC	46	18.65	3.41	85	19.35	4.29	-0.96
RSCS-SF							
Positive Religious/Spiritual Coping	39	6.08	1.95	55	6.64	2.12	-1.30
Negative Religious/Spiritual Coping	81	9.94	1.64	101	10.27	1.26	-1.53
Perceived Salience	79	2.19	0.75	104	2.47	0.79	-2.44*
Perceived Efficacy	91	7.24	2.30	103	5.78	2.25	4.47**

Table 1 continued

Religious and Spiritual Experiences	63	24.63	6.72	87	22.79	6.96	1.62
SHLOC							
Spiritual Life and Faith	91	10.96	2.88	105	9.37	2.53	4.07**
God's Grace	88	15.07	3.40	101	13.19	3.13	3.96**
Passive Spiritual	61	6.48	1.79	75	6.11	1.42	1.34
Active Spiritual	93	13.33	1.87	111	12.59	1.73	2.93**

*p<.05

**p<.01

Table 2. Mean Pain Tolerance by Race and Group (in seconds; pairwise deletion method)

	N	Min	Max	Mean	SD
Black					
Active	33	14.00	180	50.07	48.36
Passive	35	5.00	180	34.51	33.77
None	29	8.30	180	42.02	45.30
Total	97	5.00	180	42.05	42.72
White					
Active	40	11.41	180	56.83	51.65
Passive	40	8.00	180	46.56	37.56
None	31	7.45	180	41.26	36.95
Total	111	7.45	180	48.78	43.13
Total					
Active	73	11.10	180	53.77	49.96
Passive	75	5.00	180	40.94	36.11
None	60	7.45	180	41.63	40.84

Table 3. Analysis of Variance for Effects of Race and Prayer on Pain Tolerance (pairwise deletion method)

	df	F	η^2	p
Race	1	1.01	0.01	0.32
Prayer	2	1.99	0.02	0.14
RaceXPrayer	2	0.37	<.00	0.69
Error	202	1837.23		

Table 4. ANCOVA for Effects of Race and Prayer on Pain Tolerance Controlling for Psychosocial Factors* (pairwise deletion method)

	df	F	η^2	p
Hoping/Praying	1	1.65	0.01	0.20
Powerful Others	1	1.82	0.02	0.18
Efficacy	1	5.64	0.05	0.02
Race	1	1.38	0.01	0.24
Prayer	2	2.91	0.05	0.06
RaceXPrayer	2	0.04	<.01	0.96
Error	105			

*Analysis controlled for CSQ-R Hoping/Praying, MHLOC Powerful Others, and RSCS-SF Efficacy

Table 5. Pairwise Comparisons for ANCOVA
(pairwise deletion method)

	EMM*	SE	p
Active vs. Passive			
Active	54.14	6.65	0.06
Passive	35.56	7.14	
Active vs. None			
Active	54.14	6.65	0.03
None	33.33	6.86	
Passive vs. None			
Passive	35.56	7.14	0.82
None	33.33	6.86	

Table 6. Mean Pain Tolerance by Race and Group
For ANCOVA Model (in seconds)

	N	Mean	SD
Black			
Active	13	51.93	51.05
Passive	11	32.91	31.38
None	14	29.36	25.82
Total	38	38.11	38.07
White			
Active	30	55.74	53.29
Passive	26	44.73	33.99
None	20	35	23.3
Total	76	46.52	41.13
Total			
Active	43	54.59	52.05
Passive	37	41.21	33.25
None	34	32.68	24.15

VITA

Samantha M. Meints, Ph.D.

Postdoctoral Research Fellow
Brigham and Women's Hospital

Education

2013 - 2017 Indiana University – Purdue University Indianapolis

Indianapolis, IN

Degree: Doctor of Philosophy

Clinical Health Psychology

Dissertation: *The Role of Prayer in Race Differences in Pain Sensitivity*

Proposed: September 4, 2015

Defended: July 12, 2017

Chair: Adam T. Hirsh, PhD

2010 - 2013

Indiana University – Purdue University Indianapolis

Indianapolis, IN

Degree: Master of Science

Clinical Psychology

Thesis: *How Does Emotionality Affect Memory in Children with Autism?*

Chair: John McGrew, PhD

2006 – 2010

Butler University

Indianapolis, IN

Degree: Bachelor of the Arts

Major: Psychology

Minor: Business

Honors Thesis: *The Effects of Emotionality on Memory in Children with Autism.*

Chair: Tara Lineweaver, PhD

Professional Interests

- Influence of psychosocial factors on pain sensation
- Race differences in clinical and experimental pain
- Clinical decision-making for pain treatment

Research Experience

PEER-REVIEWED PUBLICATIONS:

Meints SM, Stout M, Abplanalp S, Hirsh AT. (2017). Pain-related rumination, but not magnification or helplessness, mediates race and sex differences in experimental pain. *Journal of Pain*, 18(3):332-339.

Hollingshead NA, **Meints SM**, Miller MM, Robinson ME, Hirsh AT. (2016). A comparison of race-related pain stereotypes held by White and Black individuals. *Journal of Applied Social Psychology*, 46(12):718-723.

Meints SM, Miller MM, Hirsh AT. (2016). Differences in pain coping between Black and White Americans: A meta-analysis. *Journal of Pain*, 17(6), 642-653.

Hollingshead NA, **Meints SM**, Middleton SK, Free C, Hirsh AT. (2015) Examining influential factors in providers' chronic pain treatment decisions: A comparison of physicians and medical students. *BMC Medical Education*, 15(1), 164-171.

Meints SM, Hirsh AT. (2015). In-vivo praying and catastrophizing mediate the race differences in experimental pain sensitivity. *Journal of Pain*, 16(5), 491-497.

PUBLISHED ABSTRACTS

Meints SM, Otis J. (2017). Distorted ambulation and affective distress predict pain-related disability, *Journal of Pain*, 18(4), S78.

Meints SM, Wuest D, Stout M, Jackson K, Abplanalp S, Hirsh A. The effects of active vs. passive prayer on experimental pain tolerance, *Journal of Pain*, 18(4), S86-S87.

Meints SM, Gleckman AD, Hirsh AT. (2016). Social influence of disability judgments for patients with chronic pain. *Journal of Pain*, 17(4), S4.

Meints SM, Hirsh AT. (2015). Examining race differences in pain-related coping: a meta-analysis. *Journal of Pain*, 16(4), S96.

Meints SM, Middleton SK, Miller MM, Najera K, Hirsh AT. (2014) Racial differences in pain sensitivity are associated with the use of praying as a coping strategy.

Journal of Pain, 15(4), S107.

Hollingshead NA, **Meints SM**, Middleton SK, Free C, Hirsh AT. (2014). Influential factors in providers' chronic pain treatment decisions. *Journal of Pain*, 15(4), S104.

Miller MM, Hollingshead NA, **Meints SM**, Middleton SK, Hirsh AT. (2014) Further psychometric evaluation of a measure assessing gender, race/ethnicity, and age expectations of pain. *Journal of Pain*, 15(4), S105.

Meints SM, Hollingshead NA, Hirsh,AT. (2013). Factors influencing providers' treatment decisions for chronic low back pain. *Journal of Pain*, 14(4), S101.

MANUSCRIPTS IN PREPARATION:

Meints SM, Hirsh AT. (in prep). The effects of active and passive prayer on experimental pain tolerance.

ORAL PRESENTATIONS:

Meints SM. (2016). *Pain and Psychology*. Oral presentation at Spinal Cord Injury Grand Rounds, VA Boston Healthcare, Boston, MA.

Meints SM. (2016). *Race, Coping, and Pain*. Oral presentation at North American Pain School, Chateau Montebello, Montebello, Ontario.

Meints SM, Hirsh AT. (2016). *Social influence of disability judgments for patients with chronic pain*. Oral presentation at Annual Meeting of the American Pain Society, Austin, TX.

Meints SM. (2015). *The case of Simon: A patient with chronic pain*. Oral case presentation at the Clinical Psychology Proseminar. IUPUI, Indianapolis, IN.

Meints SM. (2013). *How does emotionality affect memory in children with autism?* Oral presentation at the Clinical Psychology Proseminar. IUPUI, Indianapolis, IN.

Meints SM, Patton CS, Lineweaver TT. (2010). *Mark's new puppy: The effects of emotion on the memory of children with autism*. Oral presentation at the Butler Undergraduate Research Conference. Indianapolis, IN.

Meints SM. (2009). *The emotional memory of children with autism*. Oral presentation at the Butler Summer Institute. Indianapolis, IN.

POSTER PRESENTATIONS:

Meints SM, Wuest D, Stout M, Jackson K, Abplanalp S, Hirsh AT. (2017). *The effects*

- of active vs. passive prayer on experimental pain tolerance.* Poster presentation at Annual Meeting of the American Pain Society, Pittsburgh, PA.
- Meints SM**, Otis J. (2017). *Distorted ambulation and affective distress predict pain-related disability.* Poster presentation at Annual Meeting of the American Pain Society, Pittsburgh, PA.
- Meints SM**, Hirsh AT. (2016). *Social influence of disability judgments for patients with chronic pain.* Poster presentation at Annual Meeting of the American Pain Society, Austin, TX.
- Stout M, **Meints SM**, Hirsh, AT. (2016). *The rumination component of catastrophizing mediates race differences in experimental pain tolerance.* Poster presentation at Association for Psychological Sciences Conference. Chicago, IL.
- Meints SM**, Hirsh AT. (2015). *Examining racial differences in pain-related coping: A meta-analysis.* Poster presentation at Annual Meeting of the American Pain Society, Palm Springs, CA.
- Meints SM**, Hirsh AT. (2014). *In-vivo praying and catastrophizing mediate racial differences in pain sensitivity.* Poster presentation at Indiana Psychological Association Annual Conference, Indianapolis, IN.
- Miller MN, Squillace AE, **Meints SM**, Hirsh AT. (2014). *Examining the association of trait vs. in-vivo catastrophizing and experimental pain sensitivity.* Poster presentation at Indiana University-Purdue University Indianapolis Research Day. Indianapolis, IN.
- Free CA, Hollingshead NA, **Meints SM**, Middleton SK, Hirsh AT. (2014). *Examining influential factors in providers' chronic pain treatment decisions: A comparison of physicians and medical students.* Poster presentation at Indiana University-Purdue University Indianapolis Research Day. Indianapolis, IN.
- Hollingshead NA, **Meints SM**, Middleton SK, Free CF, Hirsh AT. (2014). *Influential factors in providers' chronic pain treatment decisions.* Poster presentation at Annual Meeting of the American Pain Society. Tampa, FL.
- Meints SM**, Middleton SK, Miller MM, Najera K, Hirsh AT. (2014). *Racial differences in pain sensitivity are associated with the use of praying as a coping strategy.* Poster presentation at the Annual Meeting of the American Pain Society. Tampa, FL.
- Miller MM, Hollingshead NA, **Meints SM**, Middleton SK, Hirsh AT. (2014). *Further psychometric evaluation of a measure assessing gender, race/ethnicity, and age*

expectations of pain. Poster presentation at Annual Meeting of the American Pain Society. Tampa, FL.

Meints SM, Hollingshead NA, Hirsh AT. (2013). *Factors influencing providers' treatment decisions for chronic low back pain.* Poster presentation at Annual Meeting of the American Pain Society. New Orleans, LA.

Meints SM. (2010). *Emotionality does not affect memory in children with autism.* Poster presentation at Association for Psychological Sciences Conference. Boston, MA.

Meints SM, Patton CS, Lineweaver TT. (2010). *The effects of emotion on the memory of children with autism.* Poster presentation at the Midwest Undergraduate Cognitive Science Conference. Bloomington, IN.

Clinical Experience

2016-2017

VA Boston

Supervisor: Kysa Christie, Ph.D.

Setting: VA Medical Center

Specialty Services: Spinal Cord Injury Unit, Neuropsychology,
Dual Diagnosis Clinic, Community Living Center

Responsibilities: Conduct evidence-based individual and family therapy for veterans with spinal cord injury, multiple sclerosis, ALS, and comorbid substance abuse and PTSD using Motivational Interviewing, Cognitive Behavioral Therapy, and Acceptance and Commitment Therapy. Work with palliative care team to assist patients and families with end of life decisions and support. Complete comprehensive psychological and neuropsychological evaluations in both inpatient and outpatient settings. Work with an interdisciplinary team of providers and allied health professionals in order to provide veterans with best care possible.

2013 – 2014

Indiana Poly Clinic

2015 – 2016

Supervisor: Ari Gleckman, Ph.D. HSPP

Setting: Outpatient chronic pain clinic

Responsibilities: Conducted individual and family therapy for clients with chronic pain and co-morbid conditions such as depression, anxiety, borderline personality disorder, PTSD, schizophrenia, obesity, substance abuse/dependence, and anger. Used

Motivational Interviewing, Cognitive Behavioral Therapy, Acceptance and Commitment Therapy, Mindfulness-Based Stress Reduction therapy, Dialectical Behavior Therapy, Exposure and Response Prevention, and Cognitive Processing Therapy. Completed initial assessments for patients new to the clinic and to psychological treatment. Completed spinal cord stimulator evaluations including both a clinical interview as well as personality (MMPI-2) and cognitive (MOCA) assessments. Worked with interdisciplinary team of providers including physicians, physician assistants, podiatrist, occupational therapists, anesthesiologists, and neurologists, as well as allied health professionals.

2014 – 2015

Indiana University Neuropsychology Clinic

Supervisor: Dan Rexroth, Psy.D. HSPP

Setting: Outpatient Neuropsychology Clinic

Responsibilities: Conduct structured clinical interview with patients and family members. Completed neuropsychological assessment including measures of memory, language, intelligence, mood, and personality. Completed structured neuropsychological reports for patients and other providers. Provided feedback to patients and family members.

2012 – 2013

Richard L. Roudebush VA Medical Center

Supervisor: Jennifer Lydon, Ph.D. HSPP

Setting: Primary Care Psychology

Responsibilities: Conducted individual therapy for clients with depression, anxiety, PTSD, chronic pain, obesity, diabetes, and anger. Used motivational interviewing, Cognitive Behavioral Therapy, Acceptance and Commitment Therapy, Mindfulness, and Cognitive Processing Therapy. Structured group therapy for MOVE weight management program. Conducted triage, Interferon, and organ transplant evaluations, as well as memory screening and neuropsychological testing. Worked with interdisciplinary team of providers to address all health needs.

2011 – 2012

St. Vincent Stress Center

Supervisor: Kevin Myers, LCSW

Setting: Inpatient Adult Psychiatric Unit

Responsibilities: Conducted individual and group therapy for clients with depression,

anxiety, schizophrenia, schizoaffective disorder, borderline personality disorder, and substance abuse disorders who were dangers to themselves or others. Conducted biopsychosocial assessments. Worked with patients to create plans for post-hospitalization follow-up care.

2010-2012

Bierman ABA

Supervisor: Courtney Bierman, M.S, BCBA

Setting: Applied Behavior Analysis Center for Children with Autism

Responsibilities: Conducted individual behavior therapy with children ages 1 – 12 with Autism Spectrum Disorders. Completed VB-MAPP assessments and functional analyses. Worked with families to set goals and develop treatment plans.

Teaching Experience

2016

Course Instructor

Course: Introduction to Psychology

2016

Course Instructor

Course: Statistics Laboratory

2015

Course Instructor

Course: Health Psychology

2013-2015

Teaching Assistantship

Course: Introduction to Psychology

Supervisor: Deborah Herold, PhD

2013

Teaching Assistantship

Course: Introduction to Counseling

Supervisor: John Guare, PhD

2011-2016

Teaching Assistantship

Course: Abnormal Psychology

Supervisor: Adam Hirsh, PhD

2012

Teaching Assistantship

Course: Introduction to Psychology

Supervisor: Toni Sholty, PsyD

2011-2012

Teaching Assistantship

	Course: Stress and Health
	Supervisor: Samantha Outcalt, PhD
2011-2012	Teaching Assistantship
	Course: Child and Adolescent Psychology
	Supervisor: Terri Tarr, PhD
2011-2012	Teaching Assistantship
	Course: Abnormal Psychology
	Supervisor: Michelle Caroll, PhD
2010-2012	Teaching Assistantship
	Course: Child and Adolescent Psychology
	Supervisor: Sandra Hellyer, PhD
2011	Teaching Assistantship
	Course: Social Psychology
	Supervisor: Leslie Ashburn-Nardo
2010	Teaching Assistantship
	Course: Social Psychology
	Supervisor: Sandra Hellyer, PhD

Research and Clinical Workshops

- Translational Pain Research: How to Conduct Science that Matters. (2016). IASP's North American Pain School Faculty, Chateau Montebello, Quebec, Canada.
- Interpersonal Therapy. (2016) Diane Sobel, University of Kentucky at IUPUI.
- Mixed Effects Longitudinal Modeling. (2015) Kevin King, Ph.D., University of Washington at IUPUI.
- Acceptance and Commitment Therapy. (2015) Jennifer Lydon-Lam, Ph.D., Roudebush VAMC, at IUPUI.
- Mediation, Moderation, and Conditional Process Analysis. (2014) Steven Hayes, Ph.D., Ohio State University, at IUPUI.
- Biofeedback. (2014) Eric Scott, Ph.D., Indiana School of Medicine, at IUPUI.
- Writing from the Reader's Perspective. (2014) George D. Gopen, Ph.D. Duke University at IUPUI.
- Palliative Care. (2013) Susan Hickman, Ph.D., Indiana University School of Nursing, at IUPUI.
- Introduction to Hypnosis for Chronic Pain Management. (2013) Mark Jensen, Ph.D., University of Washington, at IUPUI.
- Introduction to Meta Analyses. (2013) Noel Card, Ph.D., University of Arizona, at IUPUI.

- Fidelity Research. (2013) Angie Rollins, PhD., ACT Center of Indiana, at IUPUI.
- Consultation. (2012) Angie Rollins, PhD., ACT Center of Indiana, at IUPUI.
- Schema Therapy. (2011) Joan Farrell, Indiana School of Medicine and Midtown CMHC, at IUPUI.

Recognition and Awards

- Junior Investigator Poster Award for Psychosocial Research. (2016) American Pain Society.
- Clinical Award. (2016) IUPUI Department of Psychology, \$100.00.
- Educational Enhancement Grant. (2015) Graduate and Professional Student Government, IUPUI, \$500.00.
- Young Investigator Travel Award. (2015) American Pain Society, \$700.00.
- Citizenship Award. (2015) IUPUI Department of Psychology, \$100.00.
- Outstanding Graduate Teaching Award. (2015) IUPUI Department of Psychology, \$100.00.
- Travel Award. (2015) IUPUI Department of Psychology, \$500.00.
- Citizenship Award – Honorable Mention. (2014) IUPUI Department of Psychology.
- Travel Award. (2014) IUPUI Department of Psychology, \$500.00.
- Research Funding Award. (2014) IUPUI Department of Psychology, \$500.00.
- Travel Award. (2013) IUPUI Department of Psychology, \$500.00.
- Research Funding Award. (2013) IUPUI Department of Psychology, \$500.00.
- Young Investigator Travel Award. (2013) American Pain Society, \$750.00.
- Travel to Present Grant. (2010) Butler University, \$1,000.00.
- Psychology Department Scholarship. (2006-2010) Butler University, \$5,000.00, yearly.
- Butler University Presidential Scholarship. (2006-2010). Butler University, \$15,000.00, yearly.

Professional Membership

- International Association for the Study of Pain
- American Academy of Pain Management
- American Pain Society
 - Psychosocial Shared Interest Group
 - Pain and Disparities Shared Interest Group
 - Military/Veterans Shared Interest Group
- Midwest Pain Society
- Indiana Psychological Association
- American Psychological Association
 - Division 38: Health Psychology
 - Division 44: Psychological study of Lesbian, Gay, Bisexual and Transgender Issues
- American Psychological Association for Graduate Students
 - Campus Representative (2012-2013)

- Association for Psychology Sciences
- Psi Chi National Honors Society in Psychology (2008-2010)
 - Chapter Treasurer (2009-2010)

Manuscript Reviews

- Reviewer for *International Journal of Psychophysiology*.
- Reviewer for *Pain Medicine*.
- Ad hoc reviewer (mentored by Adam T. Hirsh, PhD) for *Journal of Pain*.
- Ad hoc reviewer (mentored by Adam T. Hirsh, PhD and John Otis, PhD) for *Clinical Journal of Pain*.
- Ad hoc reviewer (mentored by Adam T. Hirsh, PhD) for *European Journal of Pain*.
- Ad hoc reviewer (mentored by Adam T. Hirsh, PhD) for *Pain*.