

2021

The pain related prayers (PPRAYERS) questionnaire: a preliminary principal component factor analysis

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BOSTON UNIVERSITY
SCHOOL OF MEDICINE

Thesis

**THE PAIN RELATED PRAYERS (PPRAYERS) QUESTIONNAIRE: A
PRELIMINARY PRINCIPAL COMPONENT FACTOR ANALYSIS**

by

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B.A., Johns Hopkins University, 2018

Submitted in partial fulfillment of the
requirements for the degree of
Master of Science

2021

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DEDICATION

For my mother, father, two sisters and grandmother who always see in me what I sometimes forget is there. Thank you for your continued love and support on this long journey.

ACKNOWLEDGMENTS

Thank you to Dr. Samantha Meints, Dr. Marta Illueca, Dr. Robert Edwards,
Marise Cornelius, Josephine Issenman, Maria Som and Elise Pflaumer.

THE PAIN RELATED PRAYERS (PPRAYERS) QUESTIONNAIRE: A PRELIMINARY PRINCIPAL COMPONENT FACTOR ANALYSIS

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ABSTRACT

BACKGROUND: Chronic pain affects millions of Americans every day. Research shows that using different coping strategies (e.g. catastrophizing, coping self-statement and prayer) has differential impacts on pain outcomes. One of these coping mechanisms, prayer, has been examined less frequently than others perhaps because there is currently only one measure of prayer as a coping mechanism for pain, the Prayer/ Hope subscale of the Coping Strategies Questionnaire-Revised (CSQ-R). The latter, however, is an incomplete representation of prayer practices and hence the CSQ-R only offers a narrow measure of prayer. Recent research has characterized the CSQ-R as measuring prayer in a passive nature, which may be associated with poor pain outcomes. This measure does not include an active style of prayer. Furthermore, the evolution of research characterizing the petitionary content of prayer has resulted in substantive data revealing the contrasting dimensions of the prayer content with opposite reported outcomes. Thus, there is the need for a more comprehensive measure of prayer related to pain which clearly delineates the petitionary content of prayer. The current gap in the literature highlighted the beneficial nature of certain types of prayer for pain management and also the importance of the target to which the prayer is directed but noted that there exist

no validated measures of pain-related prayer types. The aim of this study is to develop and validate a new measure of the use of prayer amongst people who experience pain, the Pain related PRAYERS (PPRAYERS) questionnaire.

METHODS: An interim data analysis was performed of 42 adult participants with chronic pain who use prayer as a means to cope with their pain who completed a battery of questionnaires including the Brief Pain Inventory, PPRAYERS, Duke University Religion Index (DUREL), Coping Strategies Questionnaire-Revised (CSQ-R) and Pain Catastrophizing Scale (PCS). The population analyzed represented a fraction of an estimated target sample of 100 participants for this phase of the research.

In order to assess the factor structure of PPRAYERS, two principal component analysis factor analyses were conducted on the Pain Related Prayer Questionnaire (PPRAYERS). In addition, bivariate correlations between the identified factors of PPRAYERS and other known pain-related psychosocial measures were examined to assess convergent and discriminant validity of the questionnaire.

RESULTS: An interim, exploratory principal component analysis yielded six factors, active prayer, passive prayer, neutral prayer, along with three other factors that were atheoretical and accounted for 77% variance. However, based on our *a priori* theory (i.e. three types of prayer: active, passive and neutral) as

well as minimal variance accounted for by the other three atheoretical factors, a follow up analysis of a three-factor model was performed and accounted for 58% variance. There was good convergent validity between the DUREL and the active prayer subscale of the PPRAYERS questionnaire. There was also good discriminant validity between the PCS and all subscales on the PPRAYERS questionnaire.

CONCLUSION: According to these preliminary data, the PPRAYERS measure is comprised of three distinct factors: active, passive, and neutral prayer and is associated with pain and other pain-related factors. This study and the creation of PPRAYERS lays the foundation for additional studies evaluating the benefit of active, passive and neutral prayer in the treatment of chronic pain especially in patients open to religious, spiritual or meditative-based coping strategies.

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LIST OF ABBREVIATIONS

AA.....	African American
BPI.....	Brief Pain Inventory
CSQ.....	Coping Strategies Questionnaire
CSQ-R.....	Coping Strategies Questionnaire Revised
DUREL.....	Duke University Religious Index
IASP.....	International Association for the Study of Pain
NHW.....	Non-Hispanic Whites
NRS.....	Numeric Rating Scale
PCS.....	Pain Catastrophizing Scale
PROMIS-29.....	Patient Reported Outcomes Measurement Information System-29
PPRAYERS.....	Pain Related Prayers Questionnaire
RCT.....	Randomized Controlled Trial

CHAPTER 1: INTRODUCTION

Pain is subjective and the experience is unique to each individual. The International Association for the Study of Pain (IASP) defines pain as “an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage” (Raja et al., 2020). Chronic pain is defined as pain that lasts for at least 3 months (Merskey, 1986; Schug et al., 2019). Chronic pain is a problem that affects approximately 20.4% (50 million) of US adults (Dahlhamer et al., 2018).

Societal Impact of Chronic Pain

Pain experiences differ between individuals based on many factors. For example, demographic factors significantly influence the pain experience such as gender, race and level of education (Edwards, 2005). The Institute of Medicine report titled “Relieving Pain In America: A Blueprint For Transforming Prevention, Care, Education, And Research” analyzed the sociocultural, psychological, economic and medical outcomes of chronic and acute pain in America (Simon, 2012). The report highlighted that 100 million Americans are affected by the impacts of pain. Gaskin and Richard (2012) using the Medical Expenditure Report found that the yearly cost of chronic pain in the United States is over 560–635 billion dollars. Thus, finding appropriate and cost-effective mechanisms to treat and manage pain has both therapeutic and economic motivations. In a national

population study of patients with chronic low back pain, there was a higher age-adjusted prevalence of chronic pain amongst Non-Hispanic White (NHW) (27.4%) patients compared to Hispanic (24.3%), Black (23.9%) and Asian (19.0%) patients. However, there was a higher pain prevalence in American Indians (35.0%) compared to all other racial groups (Deyo et al., 2006). Chronic pain is more prevalent in women, persons that were once employed but are currently unemployed, persons living in or around poverty and rural areas (Dahlhamer et al., 2018; Groenewald & Palermo, 2015). Education is also a mediating factor in pain prevalence with individuals who have a Bachelor's degree or higher reporting significantly lower chronic pain levels than their counterparts with lower educational levels (Cano et al., 2006; Reyes-Gibby et al., 2007; Weiner et al., 2006). Persons that are on Medicaid or public insurance are also more likely to report chronic pain compared to persons on private insurance, further highlighting pain disparities among those who are disadvantaged (Berk & Schur, 1998).

Gate Control Theory

A physiological explanation for pain relief is offered by Melzack and Wall's gate control theory of pain which asserts that a painful stimulus can be ameliorated by being over-ridden by the presence of a non-painful stimulus (Melzack & Wall, 1965, 1988). The gate control theory suggests that pain is controlled by gated neural pathways that can be "opened" or "closed" not only physically (i.e. through touch or neural activation) but also through mental states, attention and emotions

(Burch, 2016). This theory provides a bridge between the physical and psychological factors that affect pain perception and relief. The theory increased the emphasis upon cultural and psychological components of pain perception as well as the need for a multidisciplinary approach to pain management.

Biomedical vs Biopsychosocial Model of Pain

The biomedical model of pain focuses on the pathophysiological mechanisms behind an individual's ailment. Previous research has shown that the biomedical model, the concentration upon the sensory features of pain, provides a narrow and insufficient understanding of pain perception, especially musculoskeletal pain (Craig, 2009; Reneman et al., 2006; Sullivan, 2008).

Furthermore, in the current literature, we have seen that physiological indicators of pain may not correlate with a pain experience; the severity of tissue damage may not collate with the perceived pain (Lee & Neumeister, 2020). In other words, imaging studies have shown that because a patient presents with physiologically visible pain markers, they may or may not actually be experiencing pain an equitable level of pain (Davis et al., 2017). Moreover, previous research has shown that activation of certain brain regions that are related to pain does not imply the perception of pain (Hu & Iannetti, 2016; Iannetti et al., 2008; Mouraux et al., 2011)

Therefore, to better understand and treat chronic pain patients the biopsychosocial model is applied. On the other hand, the biopsychosocial model

is an approach to understanding a person's ailment within the context of their environment (George & Engel, 1980). As such, the biopsychosocial is accepted as the best model to understand and treat chronic pain because it views physical illness in context of physiological, psychological and socioeconomic factors (such as financial ability, family structure, spirituality etc.) (Bendelow, 2013; Craig, 2009; Gatchel et al., 2007; Moseley & Butler, 2015). Thus interdisciplinary pain management approaches embrace the comprehensive assessment of all these dimensions is essential in order to be most effective (Gatchel et al., 2007). Such an approach has been demonstrated to be the most therapeutic and cost-effective means of managing the chronic pain (Gatchel et al., 2007).

Pain Related Coping Strategies

Pain related coping strategies are behavioral and cognitive activities intended to deal with or manage a specific stressor (Haythornthwaite et al., 1998). In persons with chronic pain, different coping strategies can be used to manage and even mediate pain intensity and sensitivity (McCracken, 1997; Turner et al., 2000, 2005). Meints & Hirsh (2015) conducted a 19 study meta-analysis that found that Black persons utilized more catastrophizing and praying as coping strategies than White persons. Catastrophizing is defined as a set of cognitive and emotional reactions to pain characterized by rumination, magnification, and helplessness (Sullivan et al., 1995). Their study further suggested that White individuals engaged in more active coping strategies (e.g., ignoring pain, distraction tactics,

engaging in physical activity) while Black individuals used more passive coping strategies (e.g., hoping, praying, catastrophizing, dependency on medication/healthcare providers). Coping strategies considerably impact individual differences in pain. Some of these coping strategies can be viewed as either beneficial or maladaptive and may affect the clinical outcome of pain. Strategies such as catastrophizing, emotion-focused coping and praying/hoping are all associated with worse clinical pain, increased sensitivity to experimental pain, and worse pain related outcomes including pain interference, depression, and anxiety (Meints & Edwards, 2018). Furthermore, catastrophizing has elements of helplessness and pessimism that is characterized by the catastrophizing subscale of the CSQ-R (Rosenstiel & Keefe, 1983). Catastrophizing was a significant predictor of elevated pain distress and a moderate predictor of higher affective pain among patients with depressive symptoms (Edwards et al., 2009). In addition to catastrophizing, other types of pain-related coping also impact the pain experience. The use of coping self-statements and an increase in physical activity have been linked to improved psychological functioning in patients with low levels of pain intensity (Jensen & Karoly, 1991).

Using neuroimaging techniques, previous research has shown that there are positive physiological pain relief outcomes based on the effects of coping strategies. These studies found that pain that was perceived to be controllable resulted in attenuated activation of the anterior cingulate, insular, and secondary somatosensory cortices; areas of the brain linked with pain processing (deCharms

et al., 2005; Petrovic & Ingvar, 2002; Salomons et al., 2004). Mindfulness is another coping strategy and treatment for chronic pain and is associated with reductions in pain and changes in pain-related brain function. In a mindfulness meditation study, Kabat-Zinn and colleagues (1985) had participants partake in a 10-week meditation program that focused on stress reduction and relaxation techniques. They found that participants in the intervention group reported reduced pain and pain related symptoms; these effects were sustained up to 15 months post-meditation training. Using a similar approach, but utilizing functional magnetic resonance imaging, Zeidan and colleagues (2011) investigated the neural mechanisms of mindfulness meditation on pain. Results showed that meditation whilst undergoing noxious stimuli resulted in a reduction of pain intensity and unpleasantness compared to a neutral non-meditative state. and was associated with activation of pain-related brain regions. Furthermore, previous studies have shown that even brief mindfulness meditation practices (i.e. 1 hour of training) can produce an analgesic effect that can help individual's with their self-management of pain (Fadel Zeidan et al., 2010). Mindfulness meditation has been demonstrated to also have positive impacts on emotional and psychological well-being as it relates to pain (K. W. Brown & Ryan, 2003).

Locus of Control

Lazarus and Folkman (1984) proposed the transactional model of stress suggesting that pain is governed by an individual's ability to gain control. The

relationship between an individual's locus of control (i.e., internal or external) may relate to their chosen style of pain coping (Ai et al., 1998; Rahim-Williams et al., 2012). Internal locus of control is an individual's belief that they can control their own behavioral outcomes (Rotter, 1966). External locus of control is an individual's belief that outcomes or situations in their life are attributed to outside factors. For the scope of this current study external locus of control examples include a higher transcendent, creative or transformative power like the universe as a whole or God as understood by each individual, and on a secular level, an individual's own doctor or even chance or fate (Hiroto, 1974). In the context of pain coping, strategies are often categorized into active and passive (Kraaimaat & Evers, 2003; Snow-Turek et al., 1996). For example, active coping strategies reflect controlling one's pain through continuing with activities (i.e. ignoring or diverting attention) despite the pain whilst passive coping strategies reflect relinquishing control of the pain such as using medication, meditation or prayer (Kraaimaat & Evers, 2003; Snow-Turek et al., 1996). Locus of control, how strongly one believes they have control over situations and experiences, is closely related to an active or passive categorization; in those with an external locus, there is a greater reliance on passive strategies (Crisson & Keefe, 1988; Rotter, 1966). Individuals that exhibit a strong internal locus of control regarding their pain, believe that they can control their own pain and thus may have better functioning than those that exhibit an external locus of control, perhaps due to the former group's tendency to use active coping (Seville & Robinson, 2000).

Prayer as a Coping Strategy

Prayer, currently conceptualized as a coping strategy, is being recognized as a potential mechanism for the treatment of pain and other health conditions (Illueca & Doolittle, 2020). Prayer is considered a religious or spiritual phenomenon by which practitioners are brought into greater relationship with what they consider sacred (Ladd & Spilka, 2013). There are two general categories of prayer examined in healthcare research: intercessory prayer and personal prayer (Jors et al., 2015; Masters et al., 2006). The field of research focused on distant intercessory prayer, has gradually fallen out of favor within academic research circles, leaving the field open to more research on personal types of prayer. Intercessory prayer is the type performed by someone else not in physical contact with the person being prayed for (Roberts et al., 2009). Furthermore, a systematic review by Masters & Spielmans (2007) analyzed the findings of 15 studies that investigated the effects of intercessory prayer on clinical outcomes. The review found that there was no discernable effect for distant intercessory prayer on clinical outcomes. An example of the methodological challenges of this type of research is a large randomized controlled trial (RCT), by Benson and colleagues (2006) who studied the effects of intercessory prayer on the outcome of patients undergoing cardiac bypass surgery, the study showed that the intercessory prayer type had a contradictory impact on the clinical outcome of the patients. It also included great inconsistencies in how the intercessory prayer was conducted by

the praying groups. In addition, previous research shows inconclusive results on the effects of intercessory prayer as both being psychologically beneficial for religious individuals but also suggests the potential for both beneficial or deleterious effects on health such as increased anxiety (Vincent, 2016). These previous findings further suggest that due to inconclusive data further research into intercessory prayer be limited. As a result of the amount of effort and funds spent on a years of futile research on distant intercessory prayer, it has been suggested that further research on the effects of intercessory prayer be halted (Masters & Spielmans, 2007; McGee & Caplan, 2007; Vincent, 2016). On the other hand, personal prayer which is considered as a private expression of one's religiosity or spirituality (L. B. Brown, 1989), has been found to be correlated with a greater psychological wellbeing (Maltby et al., 1999) and is often studied in relation to other psychosocial behaviours such as coping, religiosity and pain (Bade & Cook, 2008; Jors et al., 2015; Maltby et al., 1999). Some data suggests that the consensus on the effects of prayer is inconclusive (Bush et al., 1999).

Prayer Use on the Effects of Pain in Randomized Controlled Trials

Some studies on personal prayer have been inconclusive in showing that some prayer may be related to negative physical and psychological well-being. Data are limited, at times suggesting that persons that use prayer to cope with pain experience greater levels of anxiety and depression (Andersson, 2008; Koenig, 1998; Rippentrop et al., 2005). However, once the outcomes are carefully

analyzed, it becomes evident that the content, target and way of prayer implementation play a role in the resultant positive or negative outcomes (Illueca & Doolittle, 2020). The latter point is illustrated by earlier studies that analyzed the nuances of prayer content and target of prayer which are discussed next. Andersson (2008) investigated the role of prayer in chronic pain by focusing on the effects of personal petitionary prayer by using the Coping Strategies Questionnaire (CSQ) but altering the anchor question to reflect a “higher power” instead of God. The higher power allocation was intended to be inclusive of both religious and non-religious persons to find relevance in the questionnaire, as a higher power can include God for religious persons and also be seen in a secular manner for the non-religious. However, this alteration of the CSQ has been deemed significant by later research data showing that the target of prayer (i.e. God as religious versus higher power as non-religious) has an impact on pain related outcomes (Elmholdt et al., 2017; Jegindø, et al., 2013). Using a variety of instruments, the Anderson (2008) study indicated that prayer to a higher power correlated with a higher risk of depression, higher pain intensity and worse pain related attitudes. The authors in their analysis of study limitations highlighted the “deferring” style of prayer used in the CSQ and theorized there was a lack of a “self-motivating” type of prayer-related coping associated with the prayer/hope subscale of the CSQ. The latter finding was further supported by the Meints and colleagues (2018) study several years later. Prayer as a coping strategy was linked with greater anxiety and depressive symptoms (via the Hospital Anxiety and Depression Scale) (Andersson,

2008). However, the study authors noted in their limitations that the measures used to characterize prayer in relation to pain coping did so in a deferring manner (i.e. avoidant or maladaptive) which was later defined as active or passive prayer with the data of Meints and colleagues (2018). The Anderson study attempted to show that prayer was not just performed by religious persons but could also be employed by non-religious persons as a sort of “secular prayer,” it suggested the possibility of different types of prayer as a type of coping strategy, although used unwittingly. The findings of the Anderson study lent itself to future research investigating novel terminology for the petitionary content of prayer in relation to pain coping and the emergence of different prayer types.

Different Prayer Types

A recent systematic review by Illueca & Doolittle (2020) summarized available empirical data on the use of personal prayer (in situ by the subject or with the subject with induced, chronic or post-surgical pain) and its potential beneficial or therapeutic role in pain management. The authors suggest that the target and petitionary content of the prayer are pivotal in defining the potential effects on pain-related outcomes. Previous studies have shown that religious persons experience greater benefits of the effects of prayer than non-religious folks and further highlighted the importance of the target of prayer (Eilami et al., 2019; Elmholdt et al., 2017; Meints et al., 2018; Meints & Hirsh, 2015). In a RCT by Jegindø and colleagues (2013), religious and non-religious participants were asked to pray

while undergoing a painful stimulus. There were three conditions split between religious internal personal prayer to God, a non-religious secular prayer and no prayer at all. Both religious and non-religious participants partook in all three conditions. The internal personal prayer to God condition participants were asked to personally pray to God for pain relief and good health. While in the secular prayer condition, participants were asked to personally pray to “Mr. Hansen”, which is the Dutch equivalent of the archetypal non-persona such as “Mr. Jones”. The third condition was a pain-only control and did not pray at all. The study found that prayer to God reduced pain intensity and pain unpleasantness for religious participants, but these effects were less remarkable for non-religious participants. The study further showed that religious participants had a higher expectation and stronger desire for pain relief when praying to God compared to their non-religious counterparts. The religious participants also reported, in a post-exposure questionnaire, a greater presence of God than “Mr. Hansen” while praying. In a follow up fMRI study by Elmholdt and colleagues (2017) the authors further investigated the effect of prayer to God versus “Mr Hanssen” in a group of Christians and were able to further show statistically significant benefits in pain outcomes in those who used the religious prayer to God over the use of the secular prayer to Mr. Hanssen. During this neuroimaging study they also found that religious prayer (i.e. prayer to God) reduced neural activity in the pariteofrontal regions of the brain compared to secular prayer (i.e. prayer to Mr. Hanssen).

Recent research has highlighted the petitionary content of prayer area where empirical data from a RCT is available. In the Meints et al (2018) study, healthy participants were randomized into one of three prayer type groups; active prayer, passive prayer or no prayer. Participants were then asked to submerge their hand in cold water for as long as they could tolerate while repeating either a prayer (i.e. the active prayer group) or a neutral statement (i.e. the no prayer group). This study showed that participants that engaged in active prayer had longer tolerance times than persons who participated in passive or no prayer. There was no significant difference between the passive and no prayer groups, with the active prayer being “God, help me endure the pain” while the passive prayer was “God, take the pain away.”

The Praying/Hoping subscales of the Coping Strategies Questionnaire Revised (CSQ-R) is measured in a passive nature (Meints et al., 2018). Illueca & Doolittle’s (2020) systematic review included substantive RCT data about prayer as a potential therapeutic intervention for pain and summarized the findings by highlighting the prayer types studied in empirical trials by content, type and mode of implementation. Their data reviewed showed that prayer can be characterized into four dichotomies: scriptural or mantra-like (Eilami et al., 2019), the target of the prayer (Dehkordi et al., 2016; Jegindø et al., 2013), the petitionary context (active or passive) of the prayer (Meints et al., 2018) and the implementation modes by an individual or for the individual (Beiranvand et al., 2014; Dehkordi et al., 2016; Rahman et al., 2018).

Creation of a New Pain Related Prayer Measure/ Current Study Goals

In order to cope with their pain some persons use prayer. Prayer as a coping strategy is difficult to measure. In fact, in the current literature, there is only one measure of prayer as it relates to pain. However this instrument, the CSQ-R, is a poor measure of prayer as it characterizes prayer only in a passive way. As previously discussed, passive coping, including passive prayer, is associated with poor pain outcomes. While prior literature (Meints et al., 2019) in an experimental study demonstrated that active prayer is associated with better pain outcomes as compared to passive prayer. There remain no measures to understand exactly how people with pain pray about their pain. In other words, we can only measure passive prayer about pain and not other possible types of prayer (i.e., active and neutral prayer). The ability to measure the use of different types of prayer for pain is imperative in that it will allow researchers to understand how these different types differentially relate to pain outcomes. Moreover, it may be useful in interdisciplinary treatment of chronic pain.

In cognitive behavioral therapy, the gold standard psychosocial treatment for chronic pain (Ehde et al., 2014), patients are taught ways to alter their efforts at pain coping and reframe unhelpful thoughts about pain (Keefe, 1996). Such efforts have been shown to alter patients' pain coping and, as a result, improve their pain and function (Carpenter et al., 2012; Chiesa & Serretti, 2011; Dixon et

al., 2007). Participants also showed a greater ability to self-manage and react to their pain.

Based on the current literature, we know that in CBT, patients are encouraged to adopt a more active style of coping with pain. Although the existent measure only conceptualizes prayer passively, we hope to identify the importance of other types of prayer (i.e., active and neutral prayer). In doing so, we will hopefully pave the way for adapting interventions for those who use prayer to cope with pain. That is, future psychosocial interventions may aim to encourage patients to adopt a more active style of prayer. However, there are no instruments that measure prayer as it relates to pain in an active nature. The goal of this phase of the larger program of research is to create and validate a multidimensional measure of prayer for pain.

The creation of this instrument would allow an understanding of how people pray (i.e. content, target and modes of prayer) and how those different types of prayer associate with pain related outcomes. The future course of this research area is to ultimately incorporate prayer, including a more active style of prayer, as an adjuvant to other pain treatment in those who already engage in prayer.

Aims and Objectives

We aimed to examine whether the factor structure was consistent with our *a priori* theory of three factors representing active, passive and neutral prayer types using the PPRAYERS measure. Additionally, we proposed an examination

of the criterion validity (i.e. convergent and discriminant validity) of the questionnaire by comparing it to other pain-related constructs (e.g., pain intensity, pain coping, catastrophizing and religiosity). We hypothesize that active prayer would be associated with less pain intensity and interference, while passive prayer would be associated with greater catastrophizing, passive coping (as measured by the CSQ-R), and pain intensity and interference.

CHAPTER 2: METHODS AND MEASURES

STUDY DESIGN

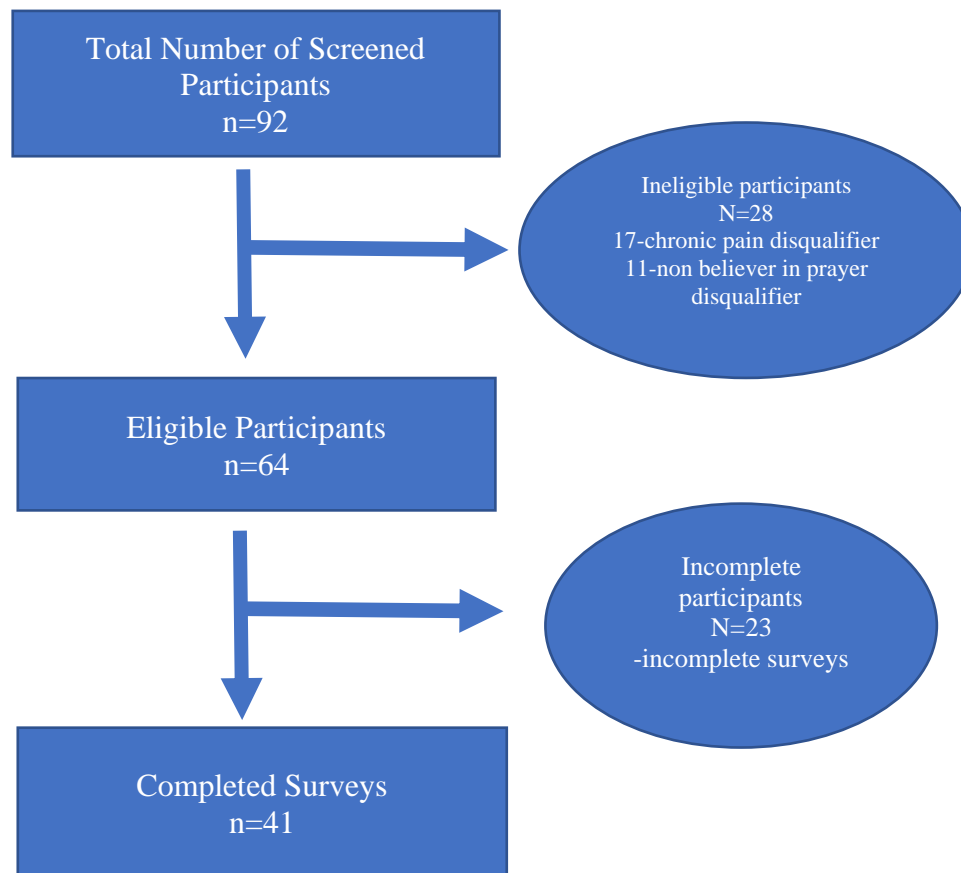
The study was a cross-sectional online survey that included a battery of pain and psychosocial questionnaires. The target population was individuals with chronic pain that believe in the use of prayer or meditation to cope with their pain. The target sample size is 500 patients with chronic pain, a sample size that will be collected over the course of three years. For the purposes of this preliminary study, the available participants data set were used.

Participants completed a series of pain related and psychosocial questionnaires online via a link to a secure online data collection platform (REDCap). Prior to completing the questionnaires, they are informed about the purpose of the study and presented with potential risks and benefits. Then, they will complete questionnaires which should take no more than 30 minutes. The risks and

discomfort to participants are believed to be minimal, with no physical risks and with study procedures not expected to be harmful or dangerous in any way to any participant.

PARTICIPANTS

Forty-one participants completed the survey study. Eligibility criteria included being an English speaker, 18-years or older, endorsing the use of prayer or meditation, and having chronic pain at least 3 months with severity of 3 or greater on a 0-10 point numeric rating scale (NRS) (with 0 being no pain and 10 pain being the most pain imaginable) (Breivik et al., 2000; Gerbershagen et al., 2011). Participants were recruited using a variety of strategies including but not limited to social media, (i.e. Facebook, LinkedIn, Twitter, Instagram, etc.), diocesan resources by the Episcopal Church of Delaware, community outreach, various healthcare, faith and chaplaincy groups, word of mouth and email distributions lists to participants of previous studies in the Pain Laboratory at Brigham and Women's Hospital. 92 individuals completed the eligibility screener, with 64 people qualifying. Participants were excluded based on the following: 6 participants did not have chronic pain, 6 participants did not experience this chronic pain for more than 3 months, 7 participants had an average pain of 3 or less on a scale from 0 (no pain) to 10 (worst pain imaginable) and 13 did not believe in using prayer to cope with pain. Some participants overlapped in disqualifying factors.

Figure 1: Recruitment Flow Chart

Inclusion and exclusion criterion breakdown for participants that completed the survey

PROCEDURES

The survey was conducted online using the Research Electronic Data Capture (REDCap) survey collection database (Harris et al., 2019). Interested participants completed an eligibility screener. Those that were eligible were directed to the main survey at which point informed consent was obtained. Participants that wished to complete the survey by mail were sent a paper version with a prepaid return envelope. Upon providing informed consent,

participants completed a demographics questionnaire, the Brief Pain Inventory (BPI), Pain related PRAYERS (PPRAYERS) Questionnaire, Patient Related Outcomes Measurement Information System 29 (PROMIS 29), Pain Catastrophizing Scale (PCS) , Duke University Religious Index (DUREL) and Coping Strategies Questionnaire Revised (CSQ-R) surveys; in that order. Completion of the survey took approximately 30 minutes. At the end of the study, participants were offered to receive more information on the project or to be added to a mailing list ,which was optional. Those interested were asked to provide their email addresses. Email addresses were kept separate from participant data to maintain anonymity. There was no financial compensation for participating in this study. At the time of the present interim analysis the study is ongoing in collaboration with the one of the physician authors of the PPRAYERS questionnaire who functions as the Clergy Medical Liaison from the Episcopal Church of Delaware. The study was approved by the Brigham and Women's Hospital Institutional Review Board (Protocol #: 2020P002278) and all procedures were in accordance with the Helsinki Declaration of 1975, as revised in 1983 (*WMA - The World Medical Association-WMA Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects*, n.d.).

MEASURES

PAIN RELATED PRAYERS SURVEY

The Pain Related Prayers Survey (PPRAYERS) is a 22-item self-report measure that aims to assess prayer habits in relation to pain. Participants rate their use of prayer statements from 0 (never) to 7 (always) on a seven-point Likert scale. The survey was created by Samantha Meints, PhD (Brigham and Women's Hospital, Boston, MA) and Marta Illueca, MD, MDiv, MSc (The Episcopal Church in Delaware and Yale Program for Medicine, Spirituality and Religion, Yale School of Medicine, New Haven, CT). All items were written to address petitionary prayer to God or a higher power. To ensure that the questionnaire was addressing our a priori theory, an expert advisory panel including pain researchers and theological scholars, qualitatively reviewed and commented on the items. The revised list is what is included in this study and can be found in Figure 2.

Figure 2: Pain Related Prayers Questionnaire- PPRAYERS

When I pray to God or a Higher power about my physical pain, I ask or say:

1. Help me so that I can overcome this pain
2. Help me so that I can endure this pain
3. Help me to manage this pain
4. Help my body to deal with this pain
5. Help me to direct my body to fight this pain
6. Show me how to handle my pain
7. Help me to rise above this pain
8. I pray for your support to help me function while in pain
9. Take my pain away
10. Cure my pain
11. Dissolve this pain
12. Help me understand why you sent me this pain
13. Lift up this painful condition from me
14. I pray that God won't make the pain last long
15. I pray for God to make the pain stop
16. Take care of me
17. Pain is just a part of life
18. I surrender my pain to the balancing influence of the universe
19. May my body align with the universe's healing power
20. The greater whole will heal my pain
21. Nature's cycles will drive my pain away
22. My body will be renewed

Item verbiage for the PPRAYERS questionnaire. Participants were asked to rate their use of prayer statements from 0 (never) to 7 (always)

PATIENT REPORTED OUTCOMES MEASUREMENT INFORMATION SYSTEM-29

The Patient Reported Outcomes Measurement Information System-29 (PROMIS 29) is a 29-item self-report measure that assesses patient health and wellbeing. Specifically, participants rate each of seven domains (i.e., physical

function, fatigue, pain interference, depressive symptoms, anxiety, ability to participate in social roles and activities, and sleep disturbance) using four items on a Likert-scale. A single item is also used to assess pain intensity ranging from 0-10 (Cella et al., 2007; Cella et al., 2010). The measure has a high reliability (0.98) and validity (Hays et al., 2018; Katz et al., 2017).

PAIN CATASTROPHIZING SCALE

The Pain Catastrophizing Scale (PCS) is a 13- item self-report instrument assessing pain catastrophizing, a set of cognitive and emotional responses to pain. Participants were asked to reflect on their past pain experiences and rate the degree to which they experience specific thoughts and feelings on a scale from 0 (not at all) to 4 (all the time) (Sullivan et al., 1995). The questionnaire is comprised of three subscales: rumination (e.g. I keep thinking about how much it hurts), magnification (e.g. worry that something serious may happen) and helplessness (e.g. there is nothing I can do to reduce the intensity of the pain). Scores are summed across the measure where higher scores indicate higher levels of catastrophic thinking.

DUKE UNI. RELIGION INDEX (DUREL)

The Duke University Religion Index (DUREL) is a 5-item self-report measure of religiosity that is used in epidemiological and observational studies. It assesses religious activity and the internal and external religiosity of the

participants. (Koenig & Büssing, 2010). The subscales of the DUREL included the Non-Organizational Religious Activity (NORA) which included religious activities performed in private, such as prayer; Organizational Religious Activity (ORA), public religious activities such as attending religious services or prayer groups; and Intrinsic Religiosity (IR) which assesses the degree of internal personal religious commitment. On the DUREL each subscale is also its own individual item. The measure has a high test-retest reliability (0.91), internal consistency and congruent validity between other measures of religiosity (Koenig & Büssing, 2010).

COPING STRATEGIES QUESTIONNAIRE REVISED (CSQ-R)

Coping Strategies Questionnaire-Revised (CSQ-R) is a 27-item self-report questionnaire that examines the frequency with which individuals engage in pain-related coping strategies (Riley & Robinson, 1997). Participants rate their use of each of six coping strategies (i.e. catastrophizing, coping self-statements, ignoring sensations, reinterpreting pain sensations, diverting attention, and praying/hoping) on a seven-point Likert scale from 0 (never do that) to 6 (always do that). The prayer/ hoping subscale includes items such as “I pray to God it won't last long” and “I pray for the pain to stop”. There is high reliability and consistency amongst racially diverse chronic-pain groups with this measure (Riley III et al., 1999).

OVERVIEW OF DATA ANALYSIS

Two separate factor analyses were performed on the PPRAYERS responses: 1) an exploratory principal component analysis (PCA) and 2) a 3-factor principal component analysis (Henson & Roberts, 2006; *Principal Components (PCA) and Exploratory Factor Analysis (EFA) with SPSS*, n.d.). Factors with eigenvalues greater than 1 (Horn, 1965) were initially retained. The scree plot from this initial analysis, plotting factors on the X axis and eigenvalues on the Y axis, combined with our *a priori* theory suggesting three unique factors led to the examination of a 3-factor PCA. In the initial exploratory PCA scree plot, the point of inflection, where the slope levels off, indicated that 4 factors should be retained. However, minimal additional variance was accounted for between the third and fourth factors. To determine which items belong in each of the three factors we examined component loadings. Component loading is the correlation of each item with the principal factors. For the component loadings, the minimum cut off was 0.50 and was chosen based on Comrey and Lee's (1992) criteria for strong versus weak loadings. According to Swartzman et al (2002) , an item needs a difference of at least 0.20 between primary and secondary loadings to be considered significant. Items that did not meet this difference were excluded. Items that did not meet the loading requirements were disregarded. Then retained items within each factor were averaged to create subscale scores. These were then correlated with other measures to assess convergent and discriminant validity of the measure. Convergent validity reflects the extent to

which two measures capture a common construct (Carlson & Herdman, 2012). In this concept, proxies are alternative measures of the same construct i.e. two different questionnaires that measure the same behaviour. For example, we would expect active prayer to be associated with religiosity and active coping (convergent) but not passive coping (discriminant). On the other hand, discriminant validity is intended to show that if two measures are meant to observe differing constructs they would not relate. Thus, discriminant validity is the degree to which measures of different concepts are distinct (Bagozzi et al., 1991; Campbell & Fiske, 1959).

Bivariate correlations were done with the three prayer categories (Active, Passive and Neutral) from the 3-factor PCA against known psychological and psychosocial metrics. This type of analysis was carried out to investigate what aspects of the PPRAYERS questionnaires correlate with established metrics of pain and coping-strategies. Using Dancey & Reidy's (2007) metrics for coefficients in Pearson correlations in psychological research, a perfect correlation was 1, strong correlations were 0.7-0.9, moderate correlation were 0.6-0.4, weak correlations were 0.3-0.1.

CHAPTER 3: RESULTS

PARTICIPANT CHARACTERISTICS

The sample consisted of 41 participants (80.5% Non-Hispanic Whites , 87.8% female and 82.9% Christian religious affiliation) The average age was 57.6 (SD17) ,48.8% of the sample was married and 53.7% of the participants indicated that they live “comfortably” with the self-reported average income ranging between \$45,001 and \$100,000 and 78% of the sample was unemployed.

Table 1
Participant Demographic Descriptive Statistics

	Frequency	Percent
Sex		
Male	5	12.2
Female	36	87.8
Racial Distribution		
African-American or Black	3	7.3
Caucasian	33	80.5
Asian	1	2.4
American Indian/Alaskan Native	2	4.9
Prefer not to answer	2	4.9
Religious Affiliation		
Christian	34	82.9
Nothing/Unaffiliated	3	7.3
Other Faith Religions	4	9.8
Education Level		
Partial High School	1	2.4
High School Grad/GED	4	9.8
Partial College	7	17.1
Bachelor’s Degree	13	31.7
Master’s Degree	13	31.7
Doctoral Degree	3	7.3
Religious/Spiritual Belief		
God	32	78
Universe	6	14.6
Higher Power	2	4.9
None of the above	1	2.4
Employed		
Yes	9	22
No	32	78

PRINCIPAL COMPONENT ANALYSIS

In the first exploratory principal component analysis (Table 4), six initial factors were found and accounted for 77% of variance. Table 5 presents the factor loadings for all items of the questionnaire in the six-factor extraction. The goal of this analysis is to demonstrate that the chosen items are in fact, consistent with the hypothesized factor structure theory (i.e. active, passive, neutral) and to determine whether we have poor items that should be removed from the measure.

Table 2: Total Variance Explained for Principal Component Analysis

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	5.857	26.62	26.621
2	4.323	19.65	46.272
3	2.539	11.53	57.811
4	1.483	6.74	64.553
5	1.47	6.68	71.232
6	1.186	5.39	76.622
7	0.89	4.05	80.667
8	0.831	3.78	84.444
9	0.634	2.88	87.324
10	0.612	2.78	90.106
11	0.429	1.95	92.057
12	0.382	1.74	93.795
13	0.315	1.43	95.228
14	0.242	1.1	96.329
15	0.206	0.938	97.267
16	0.169	0.767	98.033
17	0.129	0.585	98.619
18	0.1	0.453	99.072
19	0.08	0.363	99.434
20	0.071	0.325	99.759
21	0.035	0.161	99.92
22	0.018	0.08	100

Table 3: Component Matrix for a Principal Component Analysis for the PPRAYERS Questionnaire

Question Number	Components					
	1	2	3	4	5	6
3	0.822					
2	0.808					
1	0.806					
9	0.7					
16	0.677					
8	0.649					
15	0.647					
4	0.639					
10	0.632					
6	0.581					
20		0.919				
18		0.908				
19		0.904				
21		0.882				
22		0.734				
13			0.611			
11			0.531			
17				0.636		
5				-0.607		
12					0.545	
14					0.535	0.418
7						-0.526
a 6 components extracted.						

Note: The opacity of the colors represents the degree of strength of the factor loadings

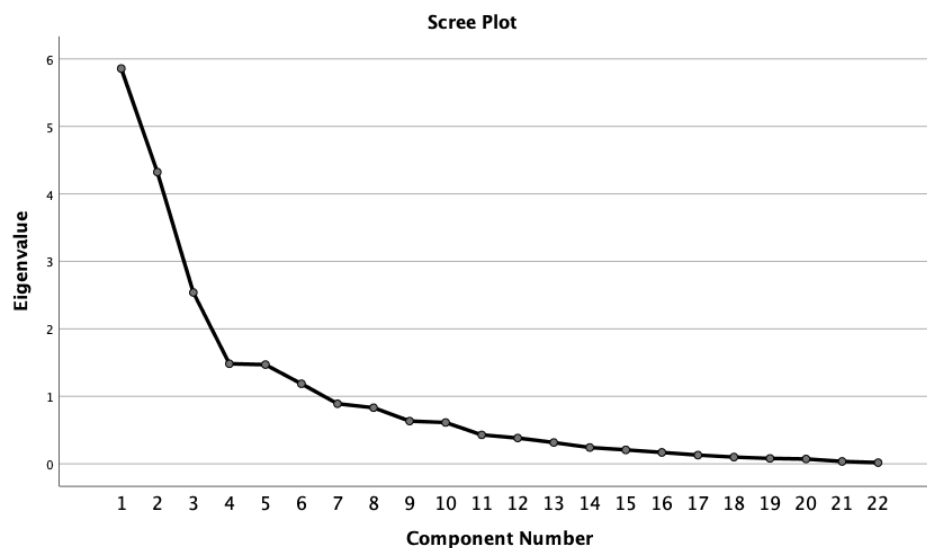
Loadings Colour Legend:

Strong	Medium	Weak
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Factors 1 (27%), factor 2 (19%) and factor 3 (12%) accounted for the greatest variance and included the largest number of items loaded onto them. Factors 1 through 3 consisted of 17 of the original 22 items. Figure 1 shows the scree plot

for the original PCA with an inflection point at four factors. Factor 4 (7%), factor 5 (7%) and factor 6 (5%) were inconsistent with our *a priori* theories, contributed to similar levels of variance and as such were disregarded. It is worth noting that a PCA is a mathematical approach that is to be buttressed by qualitative concepts (Henson & Roberts, 2006). As such, a follow-up 3-factor PCA was conducted because it could offer a more accurate representation of the initial theoretical underpinning of the questionnaire.

Figure 3
Scree Plot for the Principal Component Analysis of the PPRAYERS Questionnaire



Scree plot showing the inflection point and eigenvalues for the principal component analysis for the PPRAYERS questionnaire

These three factors accounted for 57.8% of the cumulative variance. The PCA with a 3- factors structure aligned with the theoretical hypothesis for the measure

suggesting that the three factors are active, passive and neutral prayer respectively. Table 6 shows the factor loadings for each item.

Table 4: Component Matrix for a 3-factor Principal Component Analysis for the PPRAYERS Questionnaire

Item	Component		
	Active Prayer	Neutral Prayer	Passive Prayer
3) Help me to manage this pain	0.822	-0.218	-0.192
2) Help me so that I can endure this pain	0.808	-0.17	-0.254
1) Help me so that I can overcome this pain	0.806	0.035	0.006
9) Take my pain away	0.7	-0.029	0.475
16) Take care of me	0.677	0.165	-0.459
8) I pray for your support to help me function while in pain	0.649	-0.092	-0.309
15) I pray for God to make the pain stop	0.647	0.085	0.324
4) Help my body to deal with this pain	0.639	0.067	-0.147
10) Cure my pain	0.632	-0.102	0.588
6) Show me how to handle my pain	0.581	0.206	-0.432
7) Help me to rise above this pain	0.475	0.204	-0.199
5) Help me to direct my body to fight this pain	0.419	0.2	-0.21
14) I pray that God won't make the pain last long	0.354	0.109	0.24
20) The greater whole will heal my pain	-0.046	0.919	-0.041
18) I surrender my pain to the balancing influence of the universe	-0.105	0.908	-0.051
19) May my body align with the universe's healing power	-0.136	0.904	-0.024
21) Nature's cycles will drive my pain away	-0.155	0.882	0.062
22) My body will be renewed	0.177	0.734	0.015
13) Lift up this painful condition from me	0.463	0.17	0.611
11) Dissolve this pain	0.327	0.188	0.531
17) Pain is just a part of life	0.089	0.287	-0.496
12) Help me understand why you sent me this pain	-0.045	0.318	0.443
a 3 components extracted.			

Note: The opacity of the colors represents the degree of strength of the factor loadings. The greyed-out questions were excluded

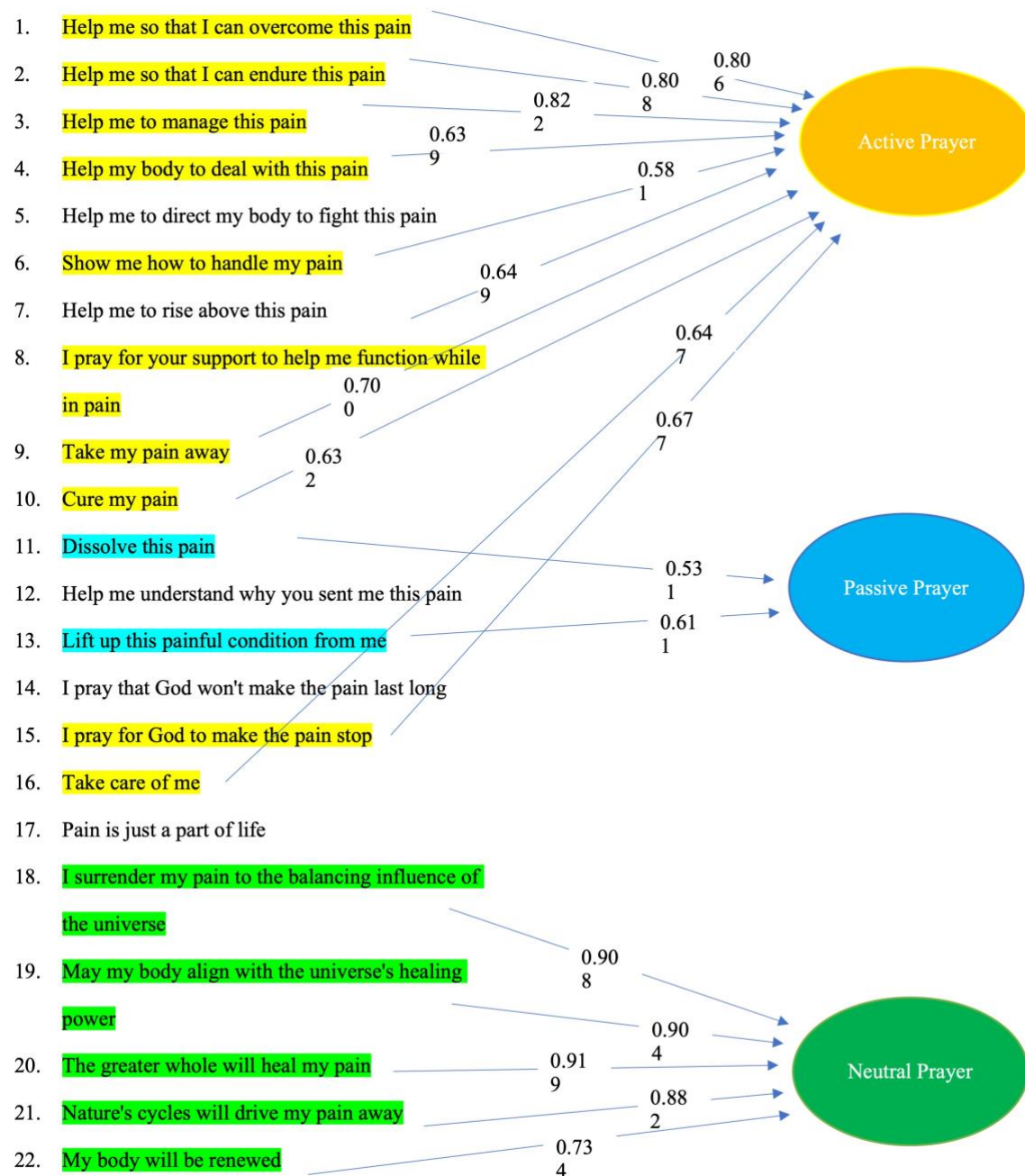
Loadings Colour Legend:

Strong	Medium	Weak	Excluded
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Items 10 and 6 loaded onto both factor 1 and 3 but with less than a 0.20 difference and, as such, were excluded from further analysis. Items 5,7,12,14 and 17 were also excluded as they did not meet the factor loadings minimum cut off (i.e. 0.50).

Figure 4 shows the component loadings for each item on the PPRAYERS scale in relation to the construct on which it corresponds. The verbiage of the items was chosen and created to reflect active, passive and neutral statements towards God or a higher power. The neutral prayer was the only of the three petitionary prayers not directed to God.

Figure 4: Path Diagram for the PPRAYERS 3-Factor PCA



PPRAYERS path diagram shows what items within the PPRAYERS questionnaire that group with our three prayer types: active, passive and neutral

COMPARISON ANALYSIS

CSQR

The active prayer factor of PPRAYERS was positively correlated with the coping self-statements ($r=0.433$, $P < .05$) subscale of the CSQ-R. On the other hand, the passive prayer factors showed no correlation with any coping strategies. The neutral prayer factor was correlated with the diverting attention ($r=0.319$, $P < 0.05$), ignoring sensations ($r=0.430$, $P < 0.01$) and prayer/hope ($r=0.389$, $P < 0.05$) subscales.

PCS

The data did not show any significant correlations between the three prayer types and the PCS scores, as presented in Table 7.

PROMIS

As seen in Table 7, the passive prayer factor had a moderate negative correlation with the physical functioning ($r=-0.435$, $P < 0.01$) and social health score ($r=-0.420$, $P < 0.01$) subscale of the PROMIS; in other words, greater utilization of passive prayer in response to pain is associated with poorer physical functioning. On the other hand, a negative correlation on the social health score suggests better social health indicators (i.e. ability to participate in social roles and activities). In addition, the passive prayer factor had a weak correlation with pain interference ($r=0.341$, $P < 0.05$). Greater endorsement of passive prayer

was associated with greater pain interference. There were no associations between the active and neutral prayer factors and any of the PROMIS subscales

DUREL

The active prayer construct had a moderate correlation with the first IR item ($r=0.433$, $P < 0.01$) and the third item ($r=0.371$, $P < 0.05$), it also correlates with NORA construct ($r=0.349$, $P < 0.05$) of the DUREL. A higher score on the IR subscale is linked with a greater level of individual religiosity and spirituality while higher scores on the NORA is an individual's participation related to religious activities beyond structured religious activities such as prayer and bible study groups. The passive and neutral prayer factors were not correlated with the DUREL.

Table 5: Correlation coefficients between the PPRAYERS and the CSQR, PCS, Promis-29 and DUREL

	Subscale Label	Active Prayer	Passive Prayer	Neutral Prayer
CSQR ^a	Diverting Attention	0.101	-0.019	.319*
	Catastrophizing	0.153	0.281	0.109
	Reinterpreting Pain Sensations	0.128	-0.292	0.228
	Ignoring sensations	0.002	-0.059	.430**
	Coping Self-Statements	.433**	0.077	0.243
	Prayer/Hoping	0.201	0.107	.389*
PCS ^b	PCS Total Score	-0.033	0.129	0.026
Promis ^c	Physical Function	-0.272	-.435**	-0.115
	Anxiety	0.083	-0.176	0.06
	Depressive Symptoms	-0.051	-0.048	-0.088
	Fatigue	-0.019	0.074	0.124
	Sleep Disturbance	0.092	0.009	0.047
	Social Health	-0.265	-.420**	-0.061
	Pain Interference	-0.013	.341*	0.091
	Average Pain	0.211	0.24	0.119
DUREL ^d	Organizational religious activity	0.046	-0.274	-0.238
	Non-organizational religious activity	.349*	0.106	0.182
	Intrinsic Religiosity Q1	.433**	-0.072	0.138
	Intrinsic Religiosity Q2	0.224	0.152	0.101
	Intrinsic Religiosity Q3	.371*	0.066	0.101

Notes: a= Coping Strategies Questionnaire Revised b= Pain Catastrophizing Scale c= Patient Reported Outcomes Measurement Information System-29 d= Duke Uni. Religion Index

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

CHAPTER 4: DISCUSSION

The aim of this study was to perform a preliminary factor analysis on a novel measure of Pain related PRAYERS (PPRAYERS) scale. The results of this study showed support for a three-factor structure consistent with the active, passive and neutral prayer types hypothesis. As hypothesized, there was a distinction between the three prayer types with active prayer relating with more active coping strategies and greater religiosity. Passive prayer was related with greater pain interference, whilst negatively correlating with the physical functioning and social health subscales on the PROMIS. The neutral prayer type showed an association with both active and passive coping strategies: catastrophizing, ignoring pain sensations and diverting attention measured

Active prayer was the strongest factor in the three-factor model accounting for 26% of the variance. It included items 1-4, 8, 9, 15 & 16 on the original questionnaire which were items that comprised the active prayer question types (i.e., Help me so that I can overcome this pain, help me to manage this pain; see Figure 2). This current study found moderate correlation between the active prayer factor and the CSQ-R's coping self-statements (e.g. It won't last much longer; No matter how bad it gets, I can do it, etc.) subscale. This suggests that the active prayer factor on the PPRAYERS questionnaire could be characterizing an active coping strategy. In previous studies, participants who used positive coping self-statements, an active style of coping, had lower pain sensitivity than those who used catastrophizing, a passive type of coping (Roditi et al., 2009).

Based on these prior findings, our data may suggest that persons that engage in active prayer may be conducting a self-management style of pain coping and indicate that they use their belief system to manage in their self-management strategies.

Brown and Nicassio (1987) define active coping strategies as tactics a chronic pain patient uses when they are attempting to control their pain or to function in spite of their pain.

We look forward the final data analysis to see if there is a stronger correlation between the passive prayer types subscale of the PPRAYERS questionnaire with the CSQ-R prayer/hoping subscale as previous data has shown that the latter subscale is more passive in nature. However, individuals may use a variety of prayer types which may be influencing the overall relationships between these variables in the present study. In other words, an individual could be participating in both active and passive prayer congruently during an interaction with God.

The active prayer factor of PPRAYERS had moderate correlations with the non-organizational religious activity (NORA) and intrinsic religiosity (IR) subscales of the DUREL. This suggests that the questions being asked may highlight the religious aspects of an individual's life. Only the active prayer factor, amongst the three prayer factors, shows strong to moderate significance with the intrinsic religiosity subscales of the DUREL. This suggests that the active prayer type is associated with internal measures of an individual's faith and belief in a

higher power. The weak correlation between active prayer and the NORA subscale of the DUREL potentially suggests that the active prayer factor could be highlighting one of a series of the different underlying ways an individual engages in prayer. The NORA highlights religious activities beyond attendance of religious services such as prayer and scripture-readings (Koenig & Büssing, 2010), and as such it is expected that this subscale is associated with active prayer. Indeed, those individuals that partake in active prayer for their pain may take an active role in religious activities within their everyday life, beyond the passive attendance of organized religious services.

The passive prayer factor consisted of items 11 and 13 (i.e. Dissolve this pain and Lift up this painful condition from me, respectively) and accounted for 20% of the total variance. Although items 12 and 17 also loaded on this factor, they did not meet the minimum difference criteria previously mentioned. That said, we only have a preliminary sample. Thus, a larger sample may result in single primary factor loading and result in the inclusion of items 12 and 17. Indeed, the verbiage of these four items look to God to either take the pain away entirely or ask God why the pain was sent, consistent with a passive style of coping. Of particular interest is item 17 that states: pain is just a part of life. Although in the field of pain psychology this item may signal a sort of external locus of control (i.e. there is nothing I can do about having this pain), it is worth noting that in some religious teachings living with pain is accepted or even seen as transformative (Dunn & Horgas, 2000). In a religious context pain may be

seen as a way to draw closer to a higher power and is a part of life (Dunn & Horgas, 2000; Jors et al., 2015).

As a coping strategy, passive prayer can be included in passive coping strategies. We know that passive coping tends to be associated with poorer outcomes such as a lower pain tolerance and difficulty with physical functioning, avoidance and worse pain experiences (Beckham et al., 1991; Brown & Nicassio, 1987; Keefe & Dolan, 1986; Mercado et al., 2005; Vlaeyen & Linton, 2000). This previous research is consistent with the findings of our current study. The passive prayer factor has a moderate negative correlation with the physical function subscale of the PROMIS indicating that individuals that use this prayer type may show lower levels of physical functioning. Also negatively moderately correlated with the passive prayer subscale of the PPRAYERS questionnaire is the social health subscale of the PROMIS, which could suggest that individuals that utilized passive prayer types tend to be more active in their social roles and daily activities. Consistent with the Fear-Avoidance Model of Pain, which identifies the relationship between fear of future pain and avoidance of valued activities (Vlaeyen & Linton, 2000) our findings do not support previous results that suggest that individuals with passive coping strategies tend to pray for the pain to end and instead avoid activities that may induce or contribute to pain. This social health finding would benefit from future research. The pain interference subscale of the PROMIS showed a weak positive correlation further

suggesting that individuals that use passive coping strategies have clinically related pain that affects their everyday activities.

Meints and colleagues (2018) suggest that passive prayer, similar to other passive coping strategies, contribute to avoidant behaviours that further contribute to poor pain outcomes. However, we do not yet understand if passive prayer may be beneficial among persons with chronic pain. Previous research has found that devout Christians express great confidence in God's reciprocity and omnipresence, and this belief correlates with the further understanding that God will answer their prayers (Jegindø, Vase, Jegindø, et al., 2013; Jegindø, Vase, Skewes, et al., 2013; Schjødt et al., 2008). Thus passive prayer may lend support that the act of prayer is a social connection between God and the individual and that relationship may not necessarily directly translate into positive health outcomes. To religious persons, asking God to take pain away may not be detrimental to pain coping as pain may be seen as a part of life's journey. In fact, it may be beneficial to those that are believers, trusting that their pain, no matter how chronic will be alleviated by God. That said, it may be important to help those who use a passive style of prayer also adopt more active strategies for managing their pain in order to obtain better pain outcomes.

Neutral prayer, factor three, consisted of items 18-22 of the original questionnaire and accounted for 12% of the total variance. These items had the highest loadings of all three factors, suggesting that these items strongly group together under a unique construct. The neutral prayer type could be

conceptualized as a middle ground between both active and passive prayer types. Of the three prayer types it is the only construct that does not directly address God. Similar to the prayer to a secular being in the Jegindø et al. (2013) study, this third group could potentially highlight the prayer strategy used by individuals that believe in God or some other higher power (e.g. the universe) but may have low religiosity and thus use less God specific prayer. This supports our theory that these neutral statements were indicative of persons that use spirituality, as opposed to religiosity, to manage their pain.

The neutral prayer factor had a positive moderate correlation with the ignoring sensations subscale of the CSQ-R (i.e. I try to think of something pleasant). This finding could suggest that individuals that utilize neutral prayer engage in behaviours that may separate them from the pain or in meditational practices like Mindfulness Meditation.

This technique is similar to that found in religious participants that partook in religious prayer in the Jegindo et al (2013) study, in which religious participants that prayed to God were more relaxed and were able to disconnect from the unpleasant pain stimulus. This suggests that in the neutral prayer type that there may be aspects of active coping prayer features. In the behavioral context, this could include meditation. For the purposes of this paper, meditation is a cognitive and behavioral exercise that involves reflection or mindfulness and may not necessarily be targeted at God or a higher power (Jors et al., 2015). However,

meditation can also be used as a part of an individual's personal prayer and as a component of religious practices. Meditation has been suggested to be a strategy used by active prayer participants (Jegindø, Vase, Skewes, et al., 2013). In addition, the neutral prayer factor correlates weakly on the diverting attention and prayer/hoping subscales of the CSQR. Further suggesting that neutral prayer also includes facets of passive coping, by honing in on avoidant behaviours and an external locus of control.

As a novel type of coping, little is currently known about the individuals that fall into this unique category of neutral prayer and if this signals a different pain coping strategy. Future research on the use of petitionary prayer types in using secular modalities could further elucidate the mechanisms behind how individuals that use the neutral praying technique deal with pain.

Overall, personal prayer is an individual's engagement between the participant and a higher power, so despite what words an individual uses to pray, the act of faith in and of itself may bring about comfort and pain relief that goes beyond measurable pain-related outcomes (Jors et al., 2015). However, our preliminary factor analysis showed that the PPRAYERS questionnaire can successfully characterize three prayer types: active, passive and neutral. It highlights the importance of the verbiage/content and target of personal petitionary prayer on the effect of pain related outcomes in persons with chronic pain.

LIMITATIONS

Our study must be understood and interpreted in the settings of its limitations. The sample size of this study at the time of this interim analysis is smaller than initially intended. There are general suggestions that a sample of at least 100 participants is needed to conduct a PCA (Worthington & Whittaker, 2006). As a result of the sample size, we did not adjust for multiple comparisons; however, we identify the possibility of a type one error regarding our correlational analysis. A large sample size needs to be recruited to avoid a type one error. Recruitment was slower than expected and due to this; we were forced to run our analyses early. As such our conclusions drawn are subject to bias and confounding factors. That said, recruitment is ongoing, and analyses will be repeated upon reaching our target goal. However, for the purposes of this paper the sample size was sufficient to obtain preliminary data.

Our recruitment style could have created a confirmation bias amongst our study sample. Most participants were recruited from previous pain studies conducted at the Brigham and Women's Hospital in Boston, Massachusetts. In addition, our collaboration with the Episcopal Church of Delaware could have contributed to a higher participation of Christians. To ameliorate these possible biases, we also recruited from other churches and religious groups around the Boston, Chicago and Indianapolis regions of the continental United States as well as medical groups by referrals. It should be noted that we focused on persons that had chronic pain that happen to pray rather than selecting religious persons

who happened to have chronic pain. Yet there is the possibility of the self-selecting nature of our sample group that would impact our results and interpretation.

In addition, we recognize that we are simply measuring one type of prayer, personal, petitionary prayer to God or a higher power and are assessing self-reported frequency of certain types of prayer statements. Currently self-measurements are the standard in observing pain related outcomes and observations. Due to the small sample and the preliminary nature of this study, we did not control for other pain related variables such as diagnoses, medication use, opioid use, etc. Questions remain around the potential placebo effect of prayer. However the recent study by Elmholdt and colleagues (2017) previously discussed, also administered naloxone or saline in their RCT, to religious patients subjected to a painful stimulus prior to neuroimaging. They and found that pain was not mediated by an opioid effect and hence the data is suggestive that there was no placebo effect of prayer.

Despite efforts to recruit from diverse communities across the United States, our sample to the date of writing this paper was comprised primarily of Caucasian females. Thus, our findings are yet to be generalizable to a larger, more diverse population. This fact could also be related to the fact that more Caucasian females use prayer to cope with their chronic pain (C. L. Edwards et al., 2001; Jordan et al., 1998). Although a wide variety of strategies are being

used for recruitment of this study, the apparent imbalance in ethnic, gender and faith backgrounds may be due to the sample population of persons that use spiritual practices to cope with their pain. For future studies a more diverse group is required. Having a gender balance as well as a racially representative cohort will make for a better understanding of how prayer is used by different races and genders, ultimately making for better science and being representative of the chronic pain population. In addition, the study sample was primarily Christian despite the fact that it was opened to all religious and spiritual backgrounds, including agnostics and atheists. Baylor University's Institute for Studies of Religion conducted a study of specific attitudes, behaviors and beliefs of religion amongst Americans. 1721 adults completed the surveys with the majority of respondents identifying themselves as having a religion with only 11 % of the national sample reported they had "no religion" (Dougherty et al., 2011). This reflects our small size of agnostics and atheists that may still use prayer as a coping tool. Because prayer practice may differ based on the specific religion that one identifies as, it is important for future studies to further their strategic outreach to achieve a more successful inclusion participants of varying religious backgrounds which will also allow for validity of the questionnaire to be analyzed across different belief systems.

Future studies could further investigate the differences between each prayer type by using the items that seem to map onto the theoretical factors that show a strong correlation as identified by this current study. It is suggested that

an exploratory factor analysis as well as a confirmatory factor analysis should be conducted to consolidate the number of items. More items may be added to the passive prayer construct, as currently it only includes two items with moderate loadings. This would allow for a clearer understanding of the construct and stronger empirical mathematical evidence supported by the PCA. Ambiguous items (those that loaded onto more than one factor) such as 10 and 6 need to be further investigated as to why they seem to map onto both active and neutral prayer. It is possible that these may show a clearer pattern with one primary loading with a larger sample. However, if they remain mathematically ambiguous according to future factor analysis, they should be excluded from the finalized measure. For component stratification, a larger sample would be necessary. It would be helpful if measurement invariance (i.e., does the measure work the same across two groups of folks) was investigated in future research. In addition, future research should look to daily activities, specific pain type characteristics and concurrent pharmacological therapy including opiate use along with prayer and meditation of the chronic pain individuals and how that can mitigate pain management.

CONCLUSION

The results of the current interim analysis for this ongoing study supports a three-factor structure for the PPRAYERS questionnaire: active, passive and neutral prayer. The active prayer type correlates with more beneficial behaviours of pain

coping such as more efficient self-management of pain whilst the passive prayer type mirrors avoidant behaviour that was shown in previous studies to be potentially deleterious to health outcomes. The neutral prayer type is a novel construct and requires further investigation to better understand how it functions among people with chronic pain.

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