HEALTH LITERACY AND CHRONIC PAIN: UNDERSTANDING THE ROLE OF HEALTH LITERACY IN CHRONIC PAIN HEALTH BEHAVIORS AND OUTCOMES

by

RACHAEL ITUNU AJETOMOBI

(Under the Direction of Bernadette Heckman, Ph.D.)

ABSTRACT

Chronic pain is a significant health condition that requires a multidisciplinary approach to treatment. Currently there are efficacious interventions for treating chronic pain, but disparities occur in the assessment and treatment of chronic pain (AHRQ, 2019). Understanding the social determinants that influence pain management behaviors and health outcomes is necessary in knowing where and how to intervene and improve them. The proposed study aimed to understand the role of health literacy as a predictive factor of both pain outcomes (severity, disability, and quality of life) and pain management behaviors, including treatment adherence and following provider recommendations. It was hypothesized that individuals who report higher health literacy levels would report higher adherence to following their providers recommendations and attending treatment appointments. It was also hypothesized that people who report higher health literacy levels would report lower pain severity, disability, and higher quality of life. Data was collected through a Qualtrics Survey of patients recruited from two community clinics in Athens, GA. Analyses including Bivariate Correlational Analysis, Analysis of Variance, Principal Component Analysis, and Linear Regression Analysis were used to test

hypotheses. The results of the study partially supported the hypothesis of the study. The findings supported the hypothesis that health literacy has a significant negative correlational relationship with pain severity and disability. The results also showed that health literacy has a positive correlational relationship with health-related quality of life. The results however did not support the notion that health literacy has a relationship with adherence to treatment recommendations and treatment appointment attendance. A regression analysis was conducted to determine the strength of the relationship between health literacy and chronic pain outcomes, and it was found to explain a significant amount of the variance in pain severity, pain disability, and quality of life outcomes. The findings of the study suggest that extrinsically related health literacy skills are predictive of chronic pain severity and disability. It highlights that future research should focus on developing health literacy strategies that target population health literacy weaknesses and needs, by increasing access points to health information and resources. Additionally, this study highlights the need to continue focusing on understanding the patient provider interaction factors that can negatively impact treatment engagement and chronic pain outcomes.

INDEX WORDS: Chronic pain, health disparities, health literacy, pain management behaviors, treatment adherence, pain severity, pain disability, health related quality of life

HEALTH LITERACY AND CHRONIC PAIN: UNDERSTANDING THE ROLE OF HEALTH LITERACY IN CHRONIC PAIN HEALTH BEHAVIORS AND OUTCOMES

by

RACHAEL ITUNU AJETOMOBI

B.S., Mercer University, 2016

M.S., Georgia State University, 2018

A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2023

© 2023

Rachael Ajetomobi

All Rights Reserved

HEALTH LITERACY AND CHRONIC PAIN: UNDERSTANDING THE ROLE OF HEALTH LITERACY IN CHRONIC PAIN HEALTH BEHAVIORS AND OUTCOMES

by

RACHAEL ITUNU AJETOMOBI

Major Professor:	Bernadette Heckman, Ph.D.
Committee:	Linda Campbell, Ph.D. Alan E. Stewart, Ph.D.

Electronic Version Approved:

Ron Walcott
Dean of the Graduate School
The University of Georgia
August 2023

DEDICATION

My work and accomplishments are dedicated to those who have supported me throughout my graduate school journey. I dedicate this paper to my ever-loving parents Funke and Femi Falade, my siblings (Stephen, Juwon, and Damilare), and my closest friends and confidantes. Thank you to my family for your support, encouragement, and prayers. Thank you to my closest friends who remained steadfast during my high and low moments. And a special thank you to Bernadette Heckman, Ph.D., for your guidance, support, and contribution towards making this research project a reality.

ACKNOWLEDGMENTS

I would like to acknowledge Bernadette Heckman, Ph.D., my advisor and committee chair for her guidance in developing this dissertation research project. Thank you.

I am also grateful for the support of Alan Stewart, Ph.D. and Dr. Linda Campbell, Ph.D. for serving on my committee and supporting my efforts in this research project.

I would like to acknowledge and thank members of the Towards Health Equity Lab (THE Lab), supervised under Bernadette Heckman, Ph.D. I would specifically like to thank all the Project INSPIRE team members for their assistance in data collection at Mercy Health Center.

Thank you to the staff at Mercy Health Center and Athens Neurological Associations in Athens for welcoming my research study and supporting my data collection at these sites. Thank you to the participants for participating in this research study.

TABLE OF CONTENTS

Page

DEDICATION IV

ACKNOWLEDGEMENTS V

LIST OF TABLES VI

CHAPTER

1 INTRODUCTION 1

Statement of the Problem 1

Purpose of the Study 6

Significance 6

Framework 8

Research Questions and Hypotheses 8

Nature of the Study 9

Definitions of Terms 10

2 REVIEW OF THE LITERATURE 12

Understanding Chronic Pain 13

Chronic Pain and Pain-Related Health Disparities 16

Health Literacy 20

Health Literacy and Chronic Pain 24

Health Literacy and Health Behaviors 28

Health Literacy and Pain Severity 33

Health Literacy and Pain Disability 35
Health Literacy and Health-Related Quality of Life 36
Theoretical Framework 38
Significance 41
3 METHODS 44
Research Design 45
Participants 46
Measures 45
Procedure 51
Statistical Analysis 52
4 RESULTS 54
Data Screening 55
Sample Characteristics 55
Chronic Pain Outcomes 58
Health Literacy Results 59
Adherence Results 62
Results 62
Analysis of Covariates 65
Regression Analysis 66
5 DISCUSSION 71
Study Findings 73
Implications 81
Limitations 85

Future Research 74

Conclusion 86

REFERENCES 88

APPENDICES

A Health Literacy Questionnaire (HLQ) 113

B Brief Pain Inventory.....118

C RAND SF-36 120

D Adherence Measure 126

E Correlation Matrix.....127

CHAPTER 1

INTRODUCTION

Problem Statement

Chronic pain is a pervasive health condition that plagues an estimated 100 million Americans and approximately 1.5 billion worldwide (American Academy of Pain Medicine [AAPM], 2011). It is one of the most frequent reasons for seeking medical care and is one of the most common conditions seen in primary care practices. Chronic pain has deleterious effects, where those diagnosed with chronic pain conditions tend to suffer higher rates of disability, reduced sleep quality, anxiety, stress, depression, and reduced social activities (Furnes. Natvig, & Dysvik, 2014). Such adverse effects can significantly reduce a person's quality of life, affecting their sense of hope and even view of self.

The adverse effects of chronic pain are not limited to the individual; they extend to the health care system, costing between $261 to $300 billion annually in healthcare-related costs (Institute of Medicine of the National Academies Report, 2011). Such prevalence and social impact highlight how much of a public health concern chronic pain is and further demonstrates the necessity of developing interventions to improve treatment outcomes and address factors contributing to pain-related treatment disparities.

Health disparities are a pervasive problem in overall healthcare, with its effects extending to chronic pain treatment outcomes. Research shows that there are differences in outcomes of pain severity, pain prevalence, and quality of pain treatment among ethnic minorities, low socioeconomic status (SES) groups, older adults, and those with low literacy levels (Logan,

2017; Mackey et al., 2016; Nielen-Bohlman et al., 2004). These disparities occur due to challenges with access and utilization of care (Anderson et al., 2011). To better understand why these disparities occur, researchers must understand the facilitators and barriers to accessing and utilizing care.

Arguably there are contextual/systemic and individual factors that influence health behaviors and health outcomes. These factors consist of predisposing factors like socio-demographic factors, enabling factors like finance, education, policy, and needs factors, which are health outcomes (Andersen et al., 2011). They all interact to influence patient-provider interactions and perceived health status. Health literacy falls within the predisposing and enabling factors umbrella. It represents "the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand, and use information in ways which promote and maintain good health" (WHO, 1998 PG 10). Health literacy is more than the education level of an individual; it is a blend of skills, behaviors, and social factors that affect overall health.

Health literacy is one of the many social determinants of health; it has a growing body of research that suggests it may play an essential role in influencing health outcomes. Health literacy comprises functional, social, and critical thinking skills needed within health information-seeking contexts (Logan, 2017). It could even be such a significant predictor of health that it moderates the effects of other variables like education and race (Sentall & Haplin, 2006). Examining the relationship between health literacy and chronic pain health outcomes could inform interventions aimed at reduces barriers to better treatment outcomes.

Low health literacy can have negative effects on health and health behaviors. Research shows low health literacy has been associated with more significant hospitalizations, poor

medication adherence, poorer overall health status, and higher morbidity and mortality (Rogers et al., 2020). Additionally, low health literacy has been associated with inadequate health-related behaviors (Berkman et al., 2011). This is especially an area of concern considering pain management behaviors are critical for dealing with chronic pain.

More specifically regarding pain management behaviors, treatment of chronic pain typically involves regimens tailored to an individual's chronic pain condition. The regimens can be complicated and often require people to develop acute and preventative strategies like medication and behavioral lifestyle changes, self-monitoring of symptoms, and attending medical appointments (Powers, Gilman, & Hershey, 2006; Powers & Andrasik, 2005). Such health behaviors are an important part of pain management treatment and adhering to them have been associated with better outcomes (Dumoulin et al., 2010; Lambeek et al., 2009; Dersh et al., 2002). Health literacy may play an instrumental role within this aspect of pain-management behaviors and in turn, influence patient treatment outcomes. The Andersen model supports this notion, as health literacy is a factor within individual characteristics that interact with contextual factors to influence health behaviors (personal health practices and use of health services) and health outcomes (Andersen et al., 2011). Which highlights the importance of more studies being conducted to understand if and how health literacy influences health behaviors such as adhering to treatment recommendations and using health care services.

Additionally, the growing literature on health literacy and chronic conditions shows that health literacy can affect self-management behaviors in those diagnosed with chronic diseases like diabetes, asthma, and arthritis (Mackey et al., 2016). The implications of such findings suggest a chronic disease like chronic pain may yield similar results on the impact of health

literacy. Yet there is not enough data to conclude on health literacy's relationship with chronic pain adherence behaviors and pain experience.

Some of the studies that have been published show low health literacy can negatively affect a person’s, ability to take medications appropriately, interpret labels and health messages, opioid use, emergency care use, risk of mortality, and overall health status (Berkman et al., 2011; Rogers et al., 2020; Glassman et al., 2019; Loke et al., 2012). Notably with the studies that have been done, the findings still are not enough to make substantive conclusions on health literacy and chronic pain. For example, one study looking at the relationship between health literacy, pain awareness, medication use, and pain severity found literacy did not affect pain severity or intensity but affected medication knowledge (Devraj, Herndon, & Griffin, 2013). In contrast, another study looking at similar variables found a negative relationship between health literacy and opioid misuse, pain severity, and pain disability (Rogers et al., 2020). One meta-analysis looking at health literacy and pain found the evidence across different studies to be inconsistent (Mackey et al., 2016). Though definitive conclusions cannot be made, these studies inform that health literacy is a factor to consider in impacting both pain management behaviors and overall pain experience. Further demonstrating that the relationship between health literacy and pain-related behaviors and outcomes needs to be further clarified.

Regarding the pain experience, there is also a paucity of research on the relationship between health literacy and chronic pain-related factors like pain severity, disability, and quality of life. One study by Wolf et al. (2005), studying health literacy and functional health status, found that inadequate health literacy was independently associated with worse mental and physical health status among older adults. Although limited to an older population and generalized to all health conditions, their findings found a significant relationship between

literacy and functional health status. Another study looking at the relationship between pain intensity and health literacy found that those with higher levels of health literacy reported less pain intensity (Köppen et al., 2017). These findings suggest that health literacy may play an essential role in chronic pain-related outcomes like intensity and functional health. The relationship between health literacy and pain quality of life in those with chronic pain remains unclear (Tokuda et al., 2009; Al Sayah et al., 2013). Understanding the dynamics of the relationship could help inform treatment and possibly reduce the health disparities that occur in chronic pain treatment outcomes.

Overall, a growing number of studies highlight that those with low health literacy have poorer quality of life and poorer health-related behaviors, including pain self-management skills and lower treatment adherence (Wang et al., 2015; Mackey et al., 2016; Edward et al., 2018). Increasing the amount of studies focused on clarifying the impact health literacy has on pain management behaviors and health outcomes in primary care settings is important, given how necessary self-management behaviors are in the management of chronic pain. Low health literacy may serve as a facilitator or barrier to proper pain health behaviors, but more studies are needed as the research on this relationship is still limited and inconclusive. This study aims to expand and illuminate the relationship between health literacy and pain health behaviors, focusing on behaviors like treatment appointment adherence and following provider behavioral recommendations.

There are numerous benefits that stem from understanding the relationship between health literacy and health behaviors like treatment adherence and following provider recommendations. Primarily, by attending to literacy and understanding how it influences adherence and pain- management behaviors, clinicians and researchers can understand what

factors to target to reduce the health disparities in chronic pain treatment. Additionally, it can inform the development of health literacy sensitive approaches that improve health outcomes for patients, increase appropriate utilization of care, and positively impact accessibility to healthcare. Overall, researchers must attend to health literacy as it may be more assertive a predictor than previously recognized in predicting pain management-related behaviors and pain-related health status.

Purpose

The aim of the current study was to understand the factors that influence chronic pain management behaviors and pain-related outcomes. The variable considered is health literacy, aiming to understand how it impacts health behaviors like treatment appointment adherence and following provider recommendations, and consequently, the impact of health literacy on chronic pain related outcomes like pain disability, pain severity, and health-related quality of life. The study hopes to continue expanding the approach to studying health literacy, by utilizing a measure that assesses the multidimensional aspects of health literacy. Assessing both health literacy strengths and weaknesses in a population, instead of focusing strictly on reading, writing, and numeracy abilities.

Significance

Chronic pain conditions can be physically debilitating, psychologically distressing, and affect an individual's overall quality of life. Thankfully, researchers have developed efficacious interventions for treating chronic pain, though they involve active participation from patients. This participation requires patient engagement in health behaviors and interaction with the healthcare system, which ultimately improves clinical outcomes. Such pain health behaviors are critical to care and can be influenced by socio-cultural factors like race, education, and

socioeconomic status. Notably, very few studies have examined whether health literacy is another variable that can impact pain management behaviors. This study aims to address the gap in the literature on chronic pain and health literacy by targeting health literacy and examining its role as a variable in pain management behaviors and treatment outcomes.

Furthermore, as a construct, health literacy is typically limited to being measured in terms of reading comprehension, numeracy abilities, or education level. Yet such measures are limited in their approach to health literacy and go against the recognition of health literacy as comprising of both cognitive and functional skills. The measure used within this study has numerous scales that better encapsulate the concept of health literacy. The measurement tool used offers information on an individual's ability to understand, engage with, and use health information and health services (Osborne et al., 2013). It also assesses an organization's ability to provide services that enable a person to understand, engage with and use their health information or services (Osborne et al., 2013). This measure provides information on both health literacy skills and the individual's health literacy strengths and weaknesses. It addresses both the personal and social dimensions of health literacy. The findings of this study will help inform the research approach to defining health literacy in chronic pain studies. While also informing the development of interventions for the needs and outcomes of the individual assessed and can even be extended to the organizational interventions.

Broadly, this study informs on the way health literacy affects chronic pain health behaviors and health outcomes. It provides a foundation that informs researchers and providers on improving chronic pain self-care management skills. Some implications include the opportunity to create literacy-adapted interventions and literacy-adapted health education and information tools, which could positively influence self-management skills. Overall, the study's

findings will provide insight into the dynamics between health literacy and pain-related outcomes while illuminating the factors that need to be addressed in primary care settings to reduce health care costs and improve treatment outcomes. The current study was conducted in a rural clinic with an underserved population not limited to those who are socioeconomically disadvantaged, have ethnic minority status, and living in rural areas.

Framework

This study utilizes a behavioral framework that focuses on both contextual and individual determinants of health. The model developed by Anderson aims to identify conditions that serve as barriers or facilitators to accessing healthcare. The framework highlights that contextual characteristics, individual characteristics, health behaviors, and health outcomes all interact and influence each other (Andersen et al., 2011). It suggests that there are three sets of factors, predisposing (demographic, social, cultural) factors, enabling (economic) factors, and need (health outcomes) factors. The predisposing factors facilitate or hinder the use of services, enabling factors help individuals seek health services, and the need factors measure the perceived need for health services (Andersen et al., 2011). The model suggests socio-cultural variables like education, occupation, ethnicity, demographics, health beliefs and attitudes, interact to increase or decrease adequate access to health care (Andersen et al., 2011). Effective access is measured as improved health status, health behaviors, and satisfaction from health service use. The framework suggests individual and contextual characteristics interact to influence health behaviors, which in turn influence health outcomes.

Research Question(s) and Hypotheses

The study addressed the following research questions:

1. RQ1- Quantitative: What is the relationship between health literacy and chronic pain outcomes?
    a. Hypothesis #1: There is a statistically significant negative correlational relationship between health literacy and pain severity. Those with lower scores across health literacy domains will report higher pain severity scores.
    b. Hypothesis #2: There is a statistically significant negative correlational relationship between health literacy and pain disability. Those with higher scores across health literacy domains will report lower levels of pain disability.
    a. Hypothesis #3: There is a statistically significant positive correlational relationship between health literacy and health-related quality of life. Those with lower scores across health literacy domains will report lower quality of life.
2. RQ2– Quantitative: Does health literacy impact health behaviors such as healthcare utilization and self-management skills?
    a. Hypothesis #1: There is a statistically significant negative correlational relationship between health literacy domains and following provider recommendations about chronic pain. Those with higher scores across health literacy domains will report consistently following their provider recommendations for chronic pain management (lower scores).
    b. Hypothesis #2: There is a statistically significant negative correlational relationship between health literacy and attending treatment appointments for

chronic pain. Those with higher scores across health literacy domains will report consistently attending treatment appointments (lower scores).

Nature of the Study

The nature of this study is quantitative. The independent variable is health literacy, while the dependent variables are treatment adherence, pain disability, pain severity, health-related quality of life. Participants were recruited from an integrated primary care setting, with inclusion criteria for participants to be above the age of 18 and meet diagnosis of chronic pain based on International Association for the Study of Pain (IASP) criteria for chronic pain, which is pain that has recurred for at least three months or longer.

The Definitions and Operational Terms

For this study, the researcher chose to define the following essential terms:

*Chronic Pain**:*** This is defined as any persistent or recurring pain occurring for more than 3 to 6 months (Treede et al., 2015).

Health Literacy: This is defined as the cognitive and social skills that determine the motivation and ability of an individual to gain access to, understand, and use information in ways which promote and maintain good health." (WHO, 2015). Health literacy is broken down into nine constructs: feeling understood and supported by healthcare providers, having sufficient information to manage health; actively managing health; social support; appraisal of health information; ability to actively engage with healthcare providers: navigating the healthcare system; ability to find good health information; and understanding health information well enough to know what to do (Osborne et al., 2013).

Pain Disability: This is defined as pain-related interference in daily functioning such as general activity, walking, work, mood, enjoyment of life, relations with others, and sleep (Cleeland, 1991)

Pain Severity: This is defined as the presence or absence of pain. It is a combination of pain-related interference and intensity of the pain (Haefeli & Elfering, 2006).

Health-Related Quality of Life: This is a combination of physical functioning; role limitations caused by physical health problems; role limitations caused by emotional problems; social functioning; emotional wellbeing, energy/fatigue, pain, and general health perceptions (Hays & Morales, 2001).

Chronic Pain Self-Management: This is defined as a person's ability to manage the symptoms, treatment, physical and psychosocial consequences inherent in living with chronic pain (Barlow et al., 2002).

Pain Management Health Behaviors: This is defined as a person following their provider's treatment recommendations and attending treatment appointments for their chronic pain.

CHAPTER 2

LITERATURE REVIEW

Introduction

The purpose of this research study is to identify the impact of health literacy on chronic pain management behaviors and pain-related outcomes. The study aims to understand how health literacy impacts health behaviors like treatment appointment adherence and following provider recommendations. It also aims to examine the relationship between health literacy and chronic pain related outcomes like pain disability, pain severity, and health-related quality of life. The purpose of this literature review is to summarize the current literature regarding health literacy and its role in chronic pain treatment outcomes. The literature review also aims to summarize the current literature on health literacy and pain self-management behaviors. The review is organized into sections that provide summaries of chronic pain, chronic pain and pain related disabilities, health literacy and chronic pain, health literacy and health behaviors, health literacy and pain severity, health literacy and pain disability, health literacy and pain related quality of life. This study is also founded on a theoretical framework that is discussed in this review.

Literature Search Strategy

The primary literature search strategy included using the University of Georgia Library databases and references cited in review articles. The UGA Library included search engines in PyschINFO, PsychArticles, PubMed, and Science Direct. References identified through the reference lists of other articles were searched for in the UGA Library to access the entire manuscript. Search terms included: *health literacy, functional health literacy, critical health*

literacy, health literacy assessment, chronic pain, health disparities, health literacy and chronic pain, health literacy and health disparities, chronic pain and health disparities, health literacy and pain intensity, health literacy and pain interference, health literacy and pain disability, health literacy and quality of life, health literacy and health-related quality of life, prevalence rates and chronic pain,

The date ranges in the literature searches are primarily studies published within the past ten years, but earlier published studies were included based on relevance.

Understanding Chronic Pain

Chronic pain is a common and significant public health problem that extends beyond the borders of the United States to the global population. According to current CDC data, chronic pain affects 20% of the U.S population, meaning more than 1 in 5 adults experience chronic pain (Zeleya et al., 2019). Worldwide the number extends to around 1.5 billion people dealing with chronic pain (American Academy of Pain Medicine [AAPM], 2012). The prevalence of pain is such that it affects more individuals in the U.S. than other commonly known health conditions such as heart disease, diabetes, and cancer (AAPM, 2012). This alarming statistic shows just how impactful pain can be to both the individual and the systems they reside within. Given its prevalence, chronic pain is also one of the most frequent reasons individuals seek medical care (Dubois, Gallagher, Lippe, 2009). It is one of the most common conditions seen in primary care practices, where 52% of patients with chronic pain are managed in primary care (Dubois & Follett, 2014).

According to the Institute of Medicine of the National Academies Report: *Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research,* pain costs the American society between $261 to $300 billion annually in healthcare-related costs (2011).

This is a staggering cost to the health care system, though it is also realistic considering unrelieved pain can result in more extended hospital stays, increased rates of rehospitalization, and increased outpatient visits (AAPM, 2012). In addition to these health care costs, chronic pain affects worker productivity, resulting in an annual loss of an amount ranging between $297 to $336 billion (Institute of Medicine of the National Academies Report, 2011). This suggests that chronic pain costs society a combined total of over $560 billion annually, which only further highlights the significance of chronic pain as a public health concern and confirms a need to address it effectively.

To begin addressing the impact of chronic pain on the healthcare system and individuals diagnosed with it, one must understand what it is. According to the International Association for the Study of Pain (IASP), pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage (IASP, 2011). This definition highlights the complexity of chronic pain, showing that both biological and psychological factors influence it. Notably, the IASP distinguishes between chronic and acute pain, by indicating that pain must persist or recur for longer than three months to be considered chronic (IASP, 2011). It is important to note that there is no universal definition for chronic pain, given how subjective of an experience it can be. Nevertheless, the IASP's definition of chronic pain has been utilized throughout chronic pain research literature.

Different categories and types of chronic pain conditions occur in the body. The categories include neuropathic, nociceptive, musculoskeletal, inflammatory, psychogenic, and mechanical pain (Swieboda et al., 2013). People report experiencing pain types like low back pain, severe headache, migraine pain, cancer pain, arthritic pain, or neuropathic pain (American Academy of Pain Medicine, 2011). Pain conditions can sometimes occur together, where most

patients who suffer from one chronic pain condition report experiencing another pain condition. These chronic pain conditions may differ in where they occur in the body, yet they share the similarity of disabling those diagnosed with them. Research shows that chronic pain is one of the leading causes of disability (Vos et al., 2017). One study focusing on migraines found a significant relationship between migraines and reduced quality of life, impaired functioning, and comorbid psychiatric disorders (Antonaci, Nappi, Manzoni, & Calabresi, 2011). Another study looking at low back pain found that those living with chronic pain had a significantly higher likelihood of experiencing worse physical and mental health conditions than those who do not have low back pain, showing how psychologically distressing chronic pain can be (AAPM, 2012).

In combination with the pain experience, chronic pain can become emotionally and psychologically distressing. Research indicates that individuals with chronic pain conditions tend to suffer higher rates of disability, including reduced sleep quality, anxiety, stress, depression, and reduced social activities (Furnes, Natvig, Dysvik, 2014). Their quality of life is also negatively impacted as those who suffer from chronic pain report an impact on their overall enjoyment of life, energy levels, and ability to concentrate (AAPM, 2012). Chronic pain affects every aspect of a person's life. Its impact is so significant that six in ten Americans feel that pain research should be a top research priority; they would even be willing to pay one dollar weekly to increase funding for scientific research (AAPM, 2012). This indicates the importance of continuing research on chronic pain, understanding the risk factors, and developing intervention strategies that improve treatment outcomes.

Historically, chronic pain was conceptualized from a biological framework where treatment mainly focused on the biological mechanisms influencing the pain experience.

Thankfully within the last couple of decades, the biopsychosocial approach has been the prevailing framework for characterizing chronic pain. The biopsychosocial approach to chronic pain views the pain experience as an interaction between physiological, psychological, and social factors (Gatchel et al., 2007). It views chronic pain in context, arguing that the variability in the pain experienced results from the interaction of these factors. There is a significant amount of research evidence to support the biopsychosocial model (Gatchel et al., 2007). It offers a broad strategy that accounts for psychosocial and behavioral factors in addition to biomedical ones when assessing, diagnosing, and treating chronic pain related conditions.

The biopsychosocial framework emphasizes a whole-person treatment approach. This framework in healthcare has led to the development of therapeutic and cost-effective interdisciplinary pain treatment interventions (Gatchel et al., 2007). Some of the interventions, such as cognitive-behavioral therapy (CBT), are efficacious, cost-effective, and low risk for individuals with chronic pain (Eccleston et al., 2009; Thorn et al., 2011; Turk, 2002). Sadly, having effective treatment interventions is not enough as barriers and differences in treatment outcomes still exist. A report from the Agency for Healthcare Research and Quality (AHRQ) (2019) shows health care disparities exist within the assessment and treatment of chronic pain. This dampens the excitement around effective treatments as the occurrence of health disparities denotes that some individuals do not gain proper access to treatment interventions.

Chronic Pain and Pain-Related Health Disparities

The United States of America is home to advanced scientific technology, healthcare instruments, and overall healthcare infrastructure/options. Nevertheless, many individuals within the U.S do not obtain the benefits of the treatment-related advances around them. This inequity typically occurs due to the interaction of societal factors, health services system factors, and

individual factors (Andersen et al., 2011). These factors then influence each other to positively or negatively impact a person's access to health care and quality of healthcare, which then influences their overall health status. Importantly, these factors that interact fall under the umbrella term social determinants of health, as they are non-medical factors influencing health.

Social determinants of health are important to study considering the role they play in the prevalence of health disparities. Health disparities are preventable differences in the burden of illness, injury, disability, or mortality by one group of individuals relative to another group (CDC, 2017). Health disparities affect treatment quality and outcomes and usually occur due to income, race, and ethnicity (Logan, 2017). Understanding social determinants of health and how they interact is necessary for developing interventions to target and ideally eliminate them. According to the National Healthcare Quality and Disparities Report (NHQDR), health disparities have been seen to worsen for poor and uninsured populations (2017). The report also show that Blacks, Hispanics, American Indians, Native Hawaiians/Pacific Islanders, and Alaska Natives received worse care than Whites (AHRQ, 2017). These findings show that those with particular demographic labels are potentially not attaining their full health potential due to barriers to accessing quality and timely health care.

Health disparities are driven by social and economic disparities, extending health disparities from a health focus to an issue of equity and social justice. Studies show that socioeconomically disadvantaged people tend to experience higher rates of illness and mortality across numerous health conditions (Welp et al., 2016). Such effects of health disparities can increase the suffering and reduce the quality of life for many individuals, including those with chronic pain. Regarding pain, numerous findings show that those who have been historically, economically, and socially marginalized experience barriers to their pain management and are at

an increased risk of developing acute and chronic painful medical conditions when compared to nonmarginalized groups (Turk & Okifuji, 2002; Williams & Amris, 2017). This highlights the need for continuous advocacy on improving access to quality health care for individuals despite their race, ethnicity, or socioeconomic status.

In chronic pain disparities, demographic factors like race and ethnicity may be risk factors for health disparities. The reports on the prevalence of pain among racial/ethnic groups are inconsistent, with some studies showing no difference between Black and White people, some showing higher prevalence among Whites and others showing among Blacks (Janevic et al., 2017; Zeleya et al., 2020; Kim et al., 2017; Zajacova et al., 2021). Nevertheless, studies consistently show that racial/ethnic minority groups experience greater pain severity and impact of chronic pain (Campbell & Edwards, 2013). In patients with chronic osteoarthritis, Black individuals, compared to non-Hispanic Whites, reported greater pain severity and functional limitations (Cruz-Almedia et al., 2014).

Another study found that Black and Hispanic Americans reported greater chronic pain severity and lower quality of care (Kim et al., 2019). Regarding the quality of care, one study found racial/ethnic minorities were more likely to be prescribed NSAIDs rather than opioid analgesics or prescribed lower doses of opioids than Whites with similar pain severity levels (Mossey, 2011). Another study looking at chronic non-cancer pain like arthritis and migraines found that Black individuals experienced greater pain sensitivity and functional limitations when compared to White patients (Mossey, 2011). In addition to race/ethnicity, socioeconomic status has also influenced the severity and disability of chronic pain.

When studying health disparities, most studies focus on race/ethnicity factors, with a growing body of research highlighting the role socioeconomic status (SES) plays as a social

determinant of health. According to the Institute of Medicine, socioeconomically disadvantaged individuals report more severe pain and disability than those with middle or higher SES (2011). Additional studies support these findings and show those with low SES statuses, living in socioeconomically disadvantaged areas report more pain interference with their daily activities (Fuentes et al., 2007; Green & Hart-Johnson, 2012; Rios & Zautra, 2011; Riskowski, 2014; Ulirsch et al., 2014). Race/ethnicity and SES are not isolated factors. A person can be a minority and have a low socioeconomic status, which can compound risk factors for more severe pain and disability. Understanding the additional risk factors that interact with race and SES to affect pain outcomes will be important in improving the delivery of care and reducing health disparities.

Regarding race/ethnicity, many of the issues possibly influencing health disparities exist within assessing and treating pain. These factors include provider stereotypes, provider affect/empathy, provider-to-patient communication, patient socioeconomic status, patient pain reporting/behavior/disability, patient coping, and patient mistrust of medicine (Tait & Chibnall, 2014). Socioeconomically disadvantaged individuals face similar barriers to effective pain management, including access to healthcare and provider bias (Institute of Medicine, 2011; Joynt et al., 2013). These factors seem to cluster around patient factors, provider factors, and systemic/contextual factors, showing the intersectionality that occurs between different variables to influence health outcomes.

More specifically regarding individual factors that determine healthcare access and utilization, predisposing factors influence whether or not people use health services and enabling factors influence health service use and effective health behaviors (Andersen et al., 2011). Some of the factors within the predisposing factors include age, gender, education, occupation, ethnicity, social network, and health beliefs. The enabling factors include finances and having

the means to access health services (Andersen et al., 2011). Within these factors, socioeconomic factors like education and income exist within both predisposing and enabling factors showing the strength of its impact on health. However, education level is a limited approach to studying the impact of literacy on healthcare utilization and other health behaviors. This paper argues that health literacy should be considered an additional factor that serves as a predisposing factor that affects perceived health status and health behaviors like the use of health services and self-management of health conditions.

Health literacy

Health is influenced by the interaction of multiple factors, including biological, socioeconomic, environmental, and psychosocial factors. Aside from biological factors, psychosocial factors also determine perceived health status. Health literacy is a social determinant of health that may independently influence perceived health status (Nutbeam & Lloyd, 2006). Health systems and organizations have published reports and calls to action addressing health literacy in healthcare service delivery (Baur, 2010; Koening, 2015; Dodson et al., 2015). This has helped increase the rise of research clarifying the role of health literacy in treatment outcomes, though there is still a great need for more published articles on examining health literacy and chronic pain factors. Additionally, there are discrepancies in the definition and study of health literacy and inconsistent findings on the role health literacy plays with certain chronic conditions like pain. Signifying that more studies are needed to illuminate the relationship health literacy has with chronic pain.

Health literacy extends beyond education and income level. It is defined as “the personal characteristics and social resources needed for individuals and communities to access, understand, appraise and use information and services to make decisions about health" (World

Health Organization, 2015). It comprises functional, social, and critical thinking skills within health information-seeking contexts (Logan, 2017). Health literacy involves both knowledge acquisition abilities and skills to access and utilize that knowledge. The benefits of higher knowledge and skills may result in increased awareness of chronic pain symptoms, improved use of services, and early health intervention-seeking behaviors in those with chronic pain, which could improve treatment outcomes.

A possible risk factor for low health literacy is low socio-economic status (Lee et al., 2010; Sun et al., 2013; Van Der Heide et al., 2013a). However, health literacy is not limited to those with lower socioeconomic status. Low health literacy can affect people regardless of their race/ethnicity, income level, or geographic location. Data from a 2007 study shows nearly 36% of adults in the U.S. have low health literacy levels (Vernon et al., 2007). Furthermore, even though health literacy relies on some literacy skills, highly literate people can still have lower levels of health literacy. Therefore, the impact of low health literacy should be considered with all populations in chronic pain research, mainly because most treatment modalities for chronic pain strongly rely on individuals actively participating in their health.

Regarding health literacy and health disparities, cross-sectional studies show that health literacy may mediate the relationship between education and health behaviors and outcomes. One study conducted using data from participants in the National Assessment of Adult of Literacy (NAAL) found that health literacy mediated the relationship between educational attainment and self-rated health, receipt of flu vaccines, receipt of mammograms, and dental care (Bennett et al., 2009). Another study using similar data found that health literacy mediated the relationship between educational attainment and health-literacy-related tasks regarding child health, dosing medications, and pediatrician appointments (Yin et al., 2009). Another study by

Howard and colleagues found that health literacy explained the relationship between education and physical and mental health scores, but not preventive care use (2006). Notably, these studies measured health literacy with reading, writing, and numeracy abilities in understanding health information, yet more information could be gathered with a broader measure of health literacy. A measure that is central to the definition provided by the WHO. Overall, the studies highlight that factors within health literacy may play a critical role in health behaviors and outcomes.

Additional studies show that poor health literacy can serve as risk factors for poor health outcomes (Nutbeam, 2008). For instance, one study examining mortality rates among older adults found that health literacy independently predicted mortality (Baker et al., 2007). Low health literacy levels have also been linked to more significant hospitalizations, poor medication adherence, worse overall health status, and higher morbidity and mortality (Rogers et al., 2020). It affects a person's health decision-making and use of the healthcare system, with research showing those with lower health literacy levels report lower use of preventative healthcare services (Scott et al., 2002). Low health literacy has also been shown to negatively affect a patient's adherence to treatment regimens such as following prescribed medications (Berkman et al., 2011). Additionally, low health literacy has been associated with weaker health knowledge and health-related behaviors, an area of concern considering pain self-management skills are a critical part of dealing with chronic pain (Berkman et al., 2011).

Overall, low health literacy can increase barriers to accessing quality healthcare. This is posited by the many factors involved in accessing care, including communicating symptoms to providers, setting up and attending appointments, understanding health information, and using health information (Kickbush & Maag, 2008). These factors can serve as barriers to healthcare utilization as healthcare providers may not be communicating appropriately to patients, or

patients communicating to providers, resulting in health information not being accurately understood, or recommendations being ignored or not followed appropriately. All which impact pain management health behaviors. The dynamics of health service use involves the interaction of many variables, especially knowledge and skills, showing opportunities for health literacy to facilitate or impede the healthcare treatment process.

Notably, many studies on health literacy define the construct as reading fluency and numeracy abilities, posing limitations in understanding health literacy. The first assessments created to study health literacy were focused on assessing reading and writing skills (Chinn, 2011). Specifically, one of the most widely used measures of health literacy, the Rapid Estimate of Adult Literacy in Medicine (REALM), tests reading ability and pronunciation (Davis et al., 1991). Another frequently used test, the Test of Functional Health Literacy in Adults (TOFHLA), measures reading comprehension and numeracy abilities (Parker et al., 1995). These tests primarily focus on an individual's ability to read instruction and information in clinical situations. They do not account for whether people understand the information they have read and know how to apply it. It is important to mention that literacy skills are important considerations to account for, but they do not explore the full breadth of health literacy. Health literacy is more than reading information well; it includes having knowledge and functional abilities to apply that knowledge.

According to Osborne and colleagues, Health literacy is broken down into nine constructs: feeling understood and supported by healthcare providers, having sufficient information to manage health; actively managing health; social support; appraisal of health information; ability to actively engage with healthcare providers: navigating the healthcare system; ability to find good health information; and understanding health information well

enough to know what to do (Osborne et al., 2013). This definition of health literacy allows for more breadth by acknowledging patient-provider interaction, using the health system, cognitive barriers and strategies, knowledge of health conditions, reading, writing, numeracy abilities, social support, and beliefs and values (Osborne et al., 2013). It offers ways to capture both a person and an organization's capacity to understand, engage with, and use health information and services.

This approach to conceptualizing health literacy addresses a variety of health literacy needs beyond understanding health information. It accounts for a person's lived experience using health services, offering a detailed assessment that denotes which domains of health literacy are strengths, and which are areas of weakness. This approach to viewing health literacy will aid the development of targeted health interventions, some examples include training patients and healthcare providers to communicate more effectively, and empowering patients to actively engage with health services and manage their health.

Health Literacy and Chronic Pain

Disparities in treatment outcomes occur due to factors at the individual, provider, and contextual levels. Within these levels, there are conditions that either predispose or enable an individual's health behaviors, including use of healthcare services and other behavioral practices (Andersen et al., 2011). Some of these predisposing and enabling factors at the individual level include age, gender, education, occupation, ethnicity, finances, access to a regular source of care, health beliefs, values, and knowledge (Andersen et al., 2011). Health literacy comprises many of these factors, including health beliefs, knowledge, and skills to navigate healthcare, and has socioeconomic status as a possible risk factor (Berkman et al., 2011). Given its interaction with

many of the predisposing and enabling factors, there is a need to study health literacy in those with chronic pain.

Currently, there is a dearth of research on health literacy and chronic pain, and not enough is understood about health literacy and its influence on chronic pain outcomes. For other chronic diseases such as diabetes, cardiovascular diseases like hypertension, and acquired immunodeficiency syndrome (AIDS), health literacy has been shown to impact clinical outcomes and resource utilization (Kalichman & Rompa, 2000; William et al., 1998). Yet there has not been a significant enough focus on health literacy and chronic pain. Markedly, given the chronicity of chronic pain and its similarity to other chronic diseases, it is possible to assume the findings of health literacy and chronic diseases may apply to chronic pain. Nevertheless, more studies need to be conducted to clarify the relationship, as health literacy is still a relatively new concept in understanding pain outcomes (Speros, 2005).

Thankfully, there has been a recent expansion in published studies focusing on health literacy in pain research due to calls to action. One study looking at opioid misuse and pain experience found that health literacy had a significantly negative impact on each of the outcomes. These effects were reportedly evident above and beyond the influence of covariates, including anxiety and depression, age, gender, income, and education (Rogers et al., 2020). Another study found low health literacy was associated with worse back and leg pain reports, confusion with survey questions, and variation in resource utilization (Glassman et al., 2019). These findings suggest a relationship between health literacy and the pain experience. They also suggest a relationship between health literacy and chronic pain management behaviors including inappropriate medication use, underutilization, and overutilization of resources.

Notably, there are inconsistencies in the studies that have been published on health literacy and chronic pain. A systematic review of research published on health literacy in patients with chronic musculoskeletal diseases found mixed results on the relationship between health literacy and chronic pain (Loke et al., 2012). The review showed that one study found that those with lower health literacy had worsened physical function, with more pain and limitations (Loke et al., 2012). In comparison, another study did not show any significant relationship between the level of health literacy and rheumatoid arthritis, pain experience, fatigue, inflammatory markers, or the number of rheumatic drugs used (Loke et al., 2012). The finding did show consistent reports on health literacy being linked with increased anxiety, hospital attendance, and lower socioeconomic groups (Loke et al., 2012).

More inconsistencies can be seen where another study examining health literacy and beliefs among individuals with chronic low back pain found that health literacy was not related to low back pain beliefs and attitudes (Briggs et al., 2010). Distinctively, all participants in this study had adequate health literacy. The study's qualitative findings showed that many of the participants reported difficulties seeking, understanding, and using low back pain information (Briggs et al., 2010). In this study, health literacy was measured using the Short-form Test of Functional Health Literacy in Adults (S-TOFHLA), a limited measure of health literacy. Making the argument that if they captured health literacy with a more in-depth measure, would their findings change? Overall, the current inconsistencies in the relationship between chronic pain and health literacy may be due to using measures focused mainly on reading, writing, and numeracy abilities. Future studies should be conducted using a more thorough measure of health literacy to better understand the relationship between health literacy and chronic pain conditions.

The findings of those studies could help address some of the limitations with the measure of health literacy in previously conducted studies.

Overall, the predictive power of health literacy in chronic pain treatment remains relatively unstudied. Some researchers argue that health literacy may serve as a moderating variable that impacts health outcomes and the efficient use of the health care delivery system. One study looking at the power of health literacy found that health literacy may be more powerful a predictor of health status, health behaviors, and health-related knowledge than education or race (Sentell & Halpin, 2006). Such a study implies that health literacy could reduce the predictive power of race on health. This is notable given one study looking at race differences in adherence to headache treatment appointments found Black people were more likely than Whites to prematurely terminate treatment appointments, but the researchers could not explain why (Heckman et al., 2008). Arguably, health literacy may be the very variable influencing such treatment behaviors but is not being accounted for in chronic pain research.

Targeting health literacy in chronic pain can yield many benefits for pain management behaviors and outcomes. One research study found that after extensive education on headaches and approach management strategies, there was a significant impact on outcomes, where those who were educated reported a significant reduction in functionally incapacitating headache days, use of abortive therapy, and were more adherent to preventative treatment (Rothrock et al., 2006). These findings show aspects of health literacy can impact health behaviors such as adherence to treatment, medication use, and use of coping strategies. Therefore, more must be done to understand the aspects of health literacy related to chronic pain outcomes and health behaviors. Understanding this could aid in improving health outcomes, quality of life reports, and decreasing health care costs.

Health Literacy and Health Behaviors

The person-centered treatment approach is a foundational approach to care in the counseling psychology field and is considered the preferred and moral approach to treatment within the medical field (Epstein & Street, 2011). The WHO defines patient-centered care as "empowering people to take charge of their own health rather than being passive recipients of services" (2016). This shows that there is an active collaborative element between the patient and their healthcare system/provider in patient-centered care. Patient-centered care is rooted in core beliefs and assumptions that presumably lead to improved treatment outcomes: including patients being actively engaged in their health treatment, improved patient-provider interactions, and clinical decision making that acknowledges individual preferences, values, and needs (Epstein & Street, 2011). The patient-centered care approach offers a partnership between patients and their healthcare providers, yet it relies on a patient's ability to understand health information and make informed decisions. This increase in patient responsibility further reinforces the importance of identifying elements, like health literacy, that could affect health behaviors and in turn influence treatment outcomes.

In chronic disease management, including chronic pain, treatment typically involves a multidisciplinary approach that includes pain medication, general advice, psychotherapy, and physiotherapy (Gatchel et al., 2007). Many of these treatment options have benefits and drawbacks, yet they all rely on patient engagement and health behaviors. This is understood as the self-management aspect of chronic pain treatment. Self-management can be defined as a person's "ability to manage the symptoms, treatment, physical and psychological consequences, and lifestyle changes inherent in living with a chronic illness" (Barlow et al., 2002). It

emphasized collaborative care and involves the patient engaging in multiple behaviors to manage their chronic condition.

Self-management involves core skills that emphasize a patient's responsibility. It involves problem-solving, decision making, using health services, patient-provider partnership, action-planning, and self-tailoring (Lorig & Holman, 2005). In chronic pain, self-management can include engaging in health behaviors such as exercising, practicing relaxation strategies, or regulating mood. Other forms of self-management include evaluating and choosing treatment programs, adhering to treatment plans, and utilizing support systems.

Treatment adherence is a necessary component of self-management in chronic pain. It can be defined as the extent to which a person's behavior (i.e., taking medication, following a diet or exercise plan, and executing lifestyle change) corresponds with recommendations from healthcare professionals (WHO, 2003). This definition suggests treatment adherence is a type of health behavior. Poor treatment adherence can serve as a risk factor in health management as it has been shown to lead to increased use of the healthcare system, disease severity, and the risk of relapse (Sokol et al., 2005; Rapoff, 2010). Poor adherence is a widespread issue in the self-management of chronic pain conditions, and it needs to be addressed. Health literacy may offer a way to address adherence challenges in treatment.

As stated previously, chronic pain treatment involves tailoring treatment regimens to the individual's chronic pain condition. These regimens can be complicated and often require developing acute strategies, preventative treatments like medication and behavioral lifestyle changes, self-monitoring of symptoms, and attending medical appointments (Powers et al., 2006; Powers & Andrasik, 2005). Considering treatment regimens may vary, measurements of treatment adherence vary as well depending on the recommendation provided. Although this

complicates the definition of the construct of adherence, studies have been conducted to examine the relationship between treatment adherence and chronic pain conditions (Crandall et al., 2013; Heckman et al., 2008; Turk & Meichenbaum, 1991). Nevertheless, there is still no consensus in chronic pain research on what adequate adherence is. Hence this study utilizes a definition of adherence focused on measuring treatment appointment attendance and following provider treatment recommendations.

Additionally, within the many studies published on treatment adherence in chronic pain, most have focused on medication adherence, though low adherence rates can be seen in both appointment attendance and acute medication adherence (Ramsey et al., 2014). In research findings, rates of adherence to medical and behavioral recommendations having large variabilities (Timmerman et al., 2016; Ramsey et al., 2014). Nevertheless, noncompliance with treatment is a widespread health problem that needs to be improved. There are numerous benefits associated with improving adherence, most of which can be seen in improved pain treatment outcomes. More specifically, treatment adherence has been associated with reduced disability outcomes such as lower levels of restricted mobility, reduced working capacity, and comorbid psychopathology (Dumoulin et al., 2010; Lambeek et al., 2009; Dersh et al., 2002). Improved adherence can also decrease the frequency and severity of chronic pain conditions, improving health-related quality of life (Ramsey et al., 2014). These benefits highlight the importance of understanding how health literacy can affect adherence to treatment appointments and recommendations in pain-management.

Treatment adherence and other self-management strategies are important aspects of chronic pain treatment in primary care. Studies show that improved pain management skills have been associated with decreased pain severity and improved overall functional status (Damus et

al., 2003; Dixon et al., 2007). One meta-analysis found self-management had a significant effect in improving pain intensity and disability for chronic lower back pain (See et al., 2021). Notably, self-management behaviors like adherence or lifestyle changes can be affected by psychosocial factors. These factors can occur at the individual, provider, or systemic/contextual level. Some of these factors that serve as barriers to self-management involve depression and stress, severe pain intensity, fear of activity worsening pain, lack of social support, attendance rates to self-management programs and limited resources for accessing health resources (Bair et al., 2009; Krein et al., 2005; Day, Thorn & Kapoor, 2011).

Regarding factors that facilitate chronic pain self-management, high levels of self-efficacy have been shown to improve motivation and self-management skills (Jensen et al. 2003, Krein et al., 2005). Additionally, having a supportive relationship with healthcare providers and social support from family, friends, and peers, aids in better self-management behaviors (Hadjistavropoulos & Shymkiw 2007, Bair et al. 2009). Health literacy has also been linked as a possible facilitator and barrier to developing self-management skills (Mackey et al., 2016). Notably, most of these facilitative factors have significant research on their role in self-management, but the research on health literacy is limited.

Understanding the factors that contribute to the development and maintenance of self-management skills is essential to understanding how health literacy affects self-management. Some of those tasks in self-management involve understanding and articulating symptoms during the clinical encounter, reading and writing skills when appraising health information, and numeracy skills for understanding medicine dosage and timing (Rothman et al., 2008). These tasks require functional skills within health literacy, showing how important health literacy is to pain management.

Furthermore, Newman et al. proposed three behavioral models associated with the development of self-management skills: knowledge, self-efficacy, and beliefs (2008). Knowledge is critical to the decision-making process in pain management, and self-efficacy can impact motivation and lifestyle behaviors. Additionally, poor health and pain-related beliefs such as perceived barriers to care, perceived benefits, self-efficacy, and pain catastrophizing can negatively affect adherence to self-management strategies (Thompson et al., 2016; Halm et al., 2006.) These core aspects of developing self-management require some health literacy skills identified by Osborne and colleagues, showing that understanding the magnitude of health literacy's role and which aspects of it are significant in pain management is essential.

Currently, the research on the role health literacy plays with self-management factors is slightly mixed, with some showing support for health literacy and others not showing support. A study by Macabasco-O'Connell and others found that patients with higher health literacy had higher self-efficacy regarding the management of their condition (2011). In contrast, another study found no association between health literacy and self-efficacy (Mackey et al., 2016). For health beliefs, Huang and colleagues found a significant correlation between low health literacy and beliefs about the degree of control patients had about their chronic condition (2018). Another study found that low health literacy negatively impacted a patient's disease-related knowledge, self-efficacy, and beliefs about chronic diseases (Mackey et al., 2016). Though there are inconsistent findings, such results highlight a potentially harmful effect between low health literacy and pain-management. Which underscores the need to further understand the magnitude of the relationship between health literacy and self-management skills.

The Institute of Medicine (IOM) has identified self-management and health literacy as cross-cutting priorities for healthcare quality and disease prevention (Adams & Corrigan, 2003).

Pain self-management skills are the cornerstone of adequate and optimal pain management, and they require adequate health literacy skills. This study aims to further the research on understanding the possible predictive role health literacy may have in chronic pain management, specifically related to health behaviors around treatment adherence and following provider recommendations. By having an increased understanding of the health literacy factors that influence pain outcomes, medical professionals will be able to adapt treatment interventions to better fit the patient they are treating. Also, clarifying the mechanisms through which health literacy influences treatment outcomes is an ethical approach to care. Health literacy can serve as a barrier to efficient use of the healthcare system, contributing to the disparities within chronic pain treatment outcomes.

Health Literacy and Pain Severity

The experience of chronic pain can be debilitating to those affected, so optimizing the delivery of efficacious interventions is important in improving patient health status. Health literacy has been identified as a possible facilitator and barrier to care, yet it has not been fully addressed in pain research. To develop and optimize treatment interventions and delivery, more studies should be conducted on understanding the relationship between health literacy and chronic pain treatment outcomes.

Chronic pain severity is one of the many outcomes of pain intervention. Chronic pain severity can be understood as the pain level or intensity rating of the pain experience (Cleeland, 1991). Health literacy may have a relationship with chronic pain severity. However, there are only a limited number of studies published, with most using measures of health literacy that focus on numeracy, reading, and writing abilities. Some of the studies published show significant findings regarding low health literacy levels negatively impacting pain intensity (Van Hecke et

al., 2016). Whereas others show no relationship between health literacy and pain intensity (Devraj et al., 2013).

In the study by Devraj and colleagues, no relationship was found between health literacy and pain intensity (Devraj et al., 2013). However, for this study, health literacy was measured using the Newest Vital Sign (NVS), a brief oral test of health literacy that tests participants with questions about a nutrition label they were provided. This measure of health literacy focuses mainly on reading, numeracy, and writing abilities (Shealy & Threatt, 2016). Another set of researchers conducted a study on health literacy and pain intensity, with an expanded definition of health literacy to include self-management, confidence in filling out medical forms, difficulty understanding written information, and support use in reading health information. The findings of this study showed that higher health literacy skills were associated with less pain intensity, and self-management was critical to less pain intensity (Köppen et al., 2017).

Similar findings occurred with another study comparing health literacy to pain severity, impact, disability, and health beliefs in lower back pain. The study used the Short-form Test of Functional Health Literacy in Adults (S-TOFHLA) and found no significant relationships between health literacy and these outcomes variables (Brigg et al., 2010). A year later, the same researchers looked at the same outcome variables but used the Health Literacy Measurement Scale (HeLMS) instead of the S-TOFHLA. The HeLMS is another measure of health literacy that goes beyond functional health literacy like numeracy abilities, including communication skills, computation skills, and social support (Jordan et al., 2010). The study showed that chronic lower back pain was associated with the health literacy domain of patient attitudes and difficulty managing personal health (Briggs et al., 2011).

The inconsistencies in results can be attributed to the measure of health literacy, where an expanded definition of health literacy yielded more information about the relationship between health literacy and the pain experience. The inconsistencies do not allow for conclusive results on health literacy and pain intensity, yet they show that pain intensity can be influenced by low knowledge about pain self-management and coping strategies. Importantly, literacy and health literacy are different constructs. Literacy has a role in health literacy, but health literacy encompasses a more extensive set of skills beyond reading and writing. So, having studies conducted that address this limitation may offer more information to research and clinical practice.

Health Literacy and Pain Disability

Chronic pain is a prevalent condition that affects millions. Its effects extend to all aspects of a person's life. Research from the National Institute of Health showed that over 25 million adults in the U.S reported having high impact pain that increased their likelihood of poorer health status, disability, and use of the health care system (Nahin, 2012). In treating chronic pain, pain disability is another outcome influenced by pain treatment interventions. Pain disability can be understood as when pain affects a person's daily activities like walking, work, mood, relationships, sleep, general activity, and enjoyment of life (Cleeland, 1991). Similar to challenges within health literacy and pain severity research, there are few studies published on health literacy and chronic pain disability, with most reporting inconsistent findings. This emphasizes the necessity for more research to be conducted to clarify the relationship between health literacy and chronic pain disability.

From the studies published, no conclusions can be drawn on the relationship between health literacy and pain disability. One study found that health literacy was negatively associated

with pain disability and its effects were evident over and above the influence of covariates such as anxiety, depression, age, gender, income, and education (Rogers et al., 2020). In contrast, another study found no relationship between health literacy skills and pain disability, but they did find a relationship between health-related beliefs and pain disability (Briggs et al., 2010).

When considering self-management and chronic pain, knowledge, self-efficacy, and beliefs are considered fundamental to its development. Notably, studies explicitly focusing on knowledge found a negative correlation between pain knowledge and pain disability (Meeus et al., 2010; Van Oosterwijck et al., 2011; Van Oosterwijck et al., 2013). Some studies concluded that education could positively impact pain disability (Louw et al., 2011). Furthermore, significant pain disability has been associated with higher pain scores and lower educational status (Fletcher, 2016). Regarding beliefs, maladaptive beliefs have been shown to influence pain disability and function, more so than the current state of tissue damage (Woby et al., 2007). Self-efficacy has also been shown to affect pain interference and pain severity (Baker et al., 2014). These studies show that knowledge, self-efficacy, and beliefs are fundamental to pain disability levels, factors previously discussed as fundamental to developing and maintaining self-management behaviors (Nutbeam et al., 2008). Thus, if self-management/health behaviors can affect treatment outcomes and components of self-management are possibly influenced by health literacy, studies should investigate the relationship between health literacy and pain outcomes.

Notably, the studies cited discussing pain disability and health literacy focused on defining health literacy with measures focused on assessing literacy skills like reading, writing, and numeracy (Rogers et al., 2020; Briggs et al., 2010). The tests used were the S-TOFHLA and Short Test of Functional Health Literacy Screener (HLS). This approach to health literacy does not capture the different factors that make up health literacy, so it is crucial to address these

limitations with a broader construct of health literacy. Furthermore, research shows health literacy affects clinical outcomes; hence it would be relevant to see if it applies to chronic pain outcomes like pain severity and disability.

Health Literacy and Health-Related Quality of Life

Quality of life refers to an individual's general wellbeing. It captures overall life satisfaction, including physical health, family, education, employment, wealth, safety, security to freedom, religious beliefs, and the environment (OECD, 2013). Quality of life can be measured in various ways; however, health-related quality of life is more specific. Health-related quality of life looks at perceived health status, physical and emotional functioning. Quality of life is an essential factor for patients with chronic pain conditions. One mixed methods study showed that those with chronic pain, on average, reported lower quality of ratings (Hadi et al., 2019). The themes that emerged from the study indicated that pain affects physical functioning, interferes with relationships, work, sleep, and mood (Hadi et al., 2019). All these factors are fundamental to a person’s life quality.

Health literacy has been shown to impact the quality of life of those with chronic conditions like COPD (Stellefson et al., 2019). In another study focused on asthma, researchers found that health literacy served as a partial mediator of race/ethnic disparities in asthma knowledge and asthma-related quality of life (Washington et al., 2018). Another study looking at the relationship between health literacy and wellbeing found that individuals with low health literacy reported lower physical and psychological wellbeing (Tokuda et al., 2009). These studies support the strength of health literacy and knowledge in the overall quality of life of a person with a chronic health condition.

In contrast, a study looking at the relationship between health literacy and health-related quality of life in patients with diabetes and depression found no relationship between health literacy and health-related quality of life scores (Al Sayah et al., 2013; Al Sayah et al., 2016). Notably, researchers acknowledged limitations in their measure of health literacy, noting they did not capture the functional, critical, and communication aspects of health literacy (Al Sayah et al., 2016). Other findings in a study focused on a group of health care workers with chronic lower back pain show that socio-demographic factors like education status, age, sex, nationality had a significant relationship with health-related quality of life (Zahra et al., 2020). The findings highlight that psychosocial factors can influence the quality of life, positively or negatively. Health literacy is another psychosocial factor whose relationship with quality of life in chronic pain conditions should be clarified.

The majority of studies conducted on health literacy and quality of life have been focused on conditions other than chronic pain, resulting in a limited number of findings on health literacy and chronic pain specifically. The research published on health literacy and quality of life in chronic pain patients is inconclusive, indicating that more studies are needed to establish more robust conclusions. Arguably, some of the findings between health literacy and other chronic conditions can be assumed to apply to chronic pain conditions, yet researchers should conduct both quantitative and qualitative studies to elucidate the relationship.

Theoretical Framework

The theoretical framework for this study is Andersen's Behavioral Model of Health Services Utilization. As a framework, it offers a way to conceptualize factors that predict health service use and promote effective and efficient health service delivery. This framework offers an approach to conceptualize the numerous factors that influence healthcare use, health behaviors,

and health status. It also explores the individual and contextual characteristics that may facilitate or impede health services utilization much broader than other models. The model stresses that improving access to care can be accomplished by focusing on contextual and individual factors.

Andersen's models suggest that health behaviors are influenced by individual characteristics that can be divided into the following categories: predisposing, enabling, and need factors (Andersen et al., 2011). Predisposing factors are existing conditions that may influence or predispose the use of health services (e.g., sex, age, education, occupation, ethnicity, and other psychosocial factors such as attitudes and beliefs, etc.). They are the socio-cultural characteristics of individuals that exist before their illness. Enabling factors include personal, family, and community resources that can either facilitate or impede the use of services (e.g., finances insurance, source of health care services). They address the logistical aspects of obtaining care. Need factors refer to how a person perceives their own health or actual evaluated health by providers (e.g., functional capacity, symptoms, and general health status). Need factors tend to be a more immediate cause of health service use (Andersen et al., 2011).

The model also mentions that contextual factors have a role to play in health behaviors and health outcomes. The components of contextual factors are similar to the individual characteristics. It is also divided into predisposing, enabling, and need factors. The predisposing factors include community demographic, social, and belief factors that impact health service use. The enabling factors that influence health service use include health policies, financing, and distribution of health services facilities. The contextual need characteristics include physical environment measures and population health indicators of community health (Andersen et al., 2011). The contextual factors around a person's life can influence their health behaviors and overall health outcomes.

The model then suggests that individual and contextual factors interact to influence health behaviors such as personal behavioral health practices that ultimately impact health status. The individual and contextual factors influence the process of care delivery, including patient-provider interactions and a person's use of health services. The model notes that health behaviors also interact with individual and contextual factors to influence overall perceived and actual health status (Andersen et al., 2011). Understanding the dynamics and strength of specific factors within individual and contextual categories may be helpful for more effective intervention development and targeting barriers to health care use, proper health behaviors, and overall health outcomes. Another outcome in addition to health status is consumer satisfaction.

Andersen's model has been utilized to understand the factors that predict the use of health services. Some of the studies conducted have used the model to predict the use of health services like cardiac rehabilitation programs, mental health services, occupational therapy service, support groups, publicly funded services, physician care, usual sources of care, and much more (Grace et al., 2008; Graham et al., 2017; Pergolotti et al., 2014). The model has been used with older adults, adult and children populations, urban and rural residents, and populations of diverse ethnic and racial backgrounds. It has also been adapted to predict access to and use of medication, patient-provider interactions, and quality of life (Brown et al., 2009; Keller et al., 2012; Hong et al., 2019; Willet et al., 2018). Undoubtedly the Andersen model is a widely used theoretical framework for examining relationships between predisposing, enabling, and need for care factors and health behaviors.

A majority of the studies utilizing the Andersen model focus on age, marital status, gender/sex, education, ethnicity, and employment status as predisposing factors. The model itself recognizes education status as a predisposing factor within the individual determinant factors.

Though the Andersen model includes education, a component of health literacy, it does not focus enough on the potential effect of health literacy. Furthermore, while education may inform literacy levels, it does not capture the breadth of the cognitive and social skills within health literacy.

This study proposes that when identifying predisposing factors for the treatment of chronic conditions, health literacy may have a relationship that has not yet been fully recognized. This study aims to inform on the potential relationship health literacy has with chronic pain health behaviors such as treatment adherence and its influence on pain outcomes. It aims to do so by examining the cognitive, social, and functional skills within health literacy. A better understanding of the psychosocial factors that can influence the pain experience will allow providers, researchers, and health policymakers to appropriately adjust and account for health literacy in preventing and treating pain.

Significance

Chronic pain is a significant problem that affects all aspects of a person's life. It can occur in different parts of the body, and the toll it takes on both the individual and system makes it a public health problem. Chronic pain is influenced by biological and psychosocial factors, making it a health condition that requires a multidisciplinary approach. There are treatment interventions and approaches to care that reduce the adverse outcomes typically associated with chronic pain. However, there are individual and contextual factors that impede the effectiveness of such interventions. Understanding these factors is especially important in chronic pain as treatment typically requires following treatment regimens, talking with providers, obtaining support, and much more, to improve the pain experience.

The Andersen model suggests that individual and contextual factors influence health behavior and, in turn, health outcomes. This study primarily focuses on understanding which individual factors influence pain management behaviors, particularly health literacy. Health literacy is a social determinant of health that has been shown to affect health outcomes and health behaviors in numerous medical conditions. In chronic pain, it can serve as a possible facilitator or barrier to better self-management behaviors and clinical outcomes. This study aims to add to the literature on chronic pain and health literacy by examining whether health literacy has a predictive role in pain management behaviors like attending medical appointments and following treatment regimens.

The study also aims to identify the relationship between health literacy and perceived health status for those with chronic pain, specifically, pain severity, disability, and pain-related quality of life. Understanding this relationship is critical to developing interventions targeting health literacy and continuing research to expand on the dynamics through which health literacy may influence pain outcomes. The study's findings can also serve as a call to research for other counseling psychologists, advocating for more studies on health literacy and chronic pain outcomes, allowing for the predictive or non-predictive role of health literacy to be further understood.

In addition to the lack of research on health literacy and chronic pain, most published studies measure health literacy by focusing on literacy variables like reading, writing, and numeracy. This approach to health literacy is inconsistent with the WHO's definition of health literacy and serves as a limitation to many of the studies published. This present study offers a measure of health literacy that goes beyond literacy skills to account for the functional, interactive, and critical skills needed to enhance one's health and quality of life. Furthermore, the

study aims to add to the literature on the relationship between health literacy and chronic pain self-management and pain outcomes.

There are many benefits associated with understanding the role of health literacy in chronic pain. The benefits can impact both the individuals and the systems around them. Some of the individual-level benefits include the development of treatment interventions that are adapted to different literacy levels. Interventions can also be created to improve skills influenced by health literacy, such as patient-provider communication, medication dosing, coping strategies, and more. Also, learning the possible role of health literacy in treatment and self-management behaviors can inform the development of health education tools. For the system, with improved health literacy, the burden of care current low health literacy individuals place on the health care system can be reduced.

CHAPTER 3

METHODS

Introduction

The purpose of this chapter is to introduce the research methodology for this quantitative cross-sectional study that examined the role of health literacy in health behaviors and chronic pain treatment outcomes. This study examined the relationship between health literacy and adherence to provider recommendations, attendance of treatment appointments, pain characteristics, and quality of life among patients who endorse chronic pain problems. The independent variable was health literacy, while the dependent variables were treatment adherence, pain disability, pain severity, health-related quality of life. This chapter describes the research design and methodology, including the eligibility/selection criteria for participants and sites, sampling methods, and data collection procedures. The instruments used for data collection will be presented. The statistical data analysis and software programs used will also be described.

Research Question(s) and Hypotheses

The study addressed the following research questions:

1. RQ1- Quantitative: What is the relationship between health literacy and chronic pain outcomes?
    a. Hypothesis #1: There is a statistically significant negative correlational relationship between health literacy and pain severity. Those with lower scores across health literacy domains will report higher pain severity scores.

b. Hypothesis #2: There is a statistically significant negative correlational relationship between health literacy and pain disability. Those with higher scores across health literacy domains will report lower levels of pain disability.
c. Hypothesis #3: There is a statistically significant positive correlational relationship between health literacy and health-related quality of life. Those with lower scores across health literacy domains will report lower quality of life.

2. RQ2– Quantitative: Does health literacy impact health behaviors such as healthcare utilization and self-management skills?
    a. Hypothesis #1: There is a statistically significant negative correlational relationship between health literacy domains and following provider recommendations about chronic pain. Those with higher scores across health literacy domains will report consistently following their provider recommendations for chronic pain management.
    b. Hypothesis #2: There is a statistically significant negative correlational relationship between health literacy and attending treatment appointments for chronic pain. Those with higher scores across health literacy domains will report consistently attending treatment appointments.

Research Design and Rationale

The primary research question is whether health literacy has a role in chronic pain self-management and pain experience. More specifically, the questions aim to understand which aspects of health literacy affect self-management behaviors like treatment adherence and pain characteristics like pain severity, pain disability, and quality of life. The study addresses the research questions and hypotheses using a quantitative approach.

Participants

This study had 67 participants. The sample sizes necessary to detect significant statistical effects were determined post-hoc using G*Power (Faul et al., 2009). For a correlation analysis with power = .80, α = .05, and medium effect size = 0.30 (Cohen, 1988), it was determined that 82 participants were required to detect effects for bivariate correlations. Using G*Power, the current study had 67 participants with a resulting estimated power = .72 = .05 and effect size = 0.3.

Participants were recruited from an integrated primary care setting, with inclusion criteria for participants to be above the age of 18 and have at least one diagnosis of chronic pain that has been recurring for at least three months. There were 67 participants in the study, with most primarily recruited from Mercy Health Center, an integrated primary care facility serving socioeconomically disadvantaged populations. Mercy Health Center is a nonprofit Christian organization that provides whole-person medical care to underserved people in Athens, Georgia, and surrounding counties. It has a multidisciplinary team of psychology, primary care, social work, pharmacy, and legal disciplines to meet the needs of its patient population. A few participants were recruited from Athens Neurological Associates, a tertiary treatment facility for patients unresponsive to other types of care. As a site, it offers comprehensive neurological care, treating patients with chronic pain, migraines, major depression, sleep disorders, spinal cord injuries, Parkinson's disease, Tourette's syndrome, Dystonia, and other movement disorders.

Measures

Health Literacy Questionnaire: The Health Literacy Questionnaire (HLQ) is a measure of health literacy that covers nine conceptually distinct areas of health literacy to assess the needs of diverse groups. Its nine domains have about 4-6 items each for a total of 44 items within the

scale. The questionnaire was split into parts. The first section asked participants to rate how much they agreed or disagreed with a set of statements. The second part of the questionnaire asked participants to rate how difficult or easy it was for them to engage in a description of tasks.

The domains associated with the first part of the questionnaire are: feeling understood and supported by healthcare providers (HPS), having sufficient information to manage health (HSI), actively managing health (AMH), social support for health (SS), and appraisal of health information (CA). The mean scores range from 1 to 4. The domains associated with the second part of the questionnaire are ability to actively engage with healthcare providers (AE), navigating the healthcare system (NHS), ability to find good health information (FHI), and understanding health information well enough to know what to do (UHI). The mean scores of this domain range from 1 to 5. The HLQ provides nine individual scores based on an average of the items within each of the nine scales. It does not give an overall total score, with the reason being a total score could mask individual needs in specific health literacy domains. For this study, along with subscale scores, a total index score for health literacy was derived. For all scales, higher scores indicated higher health literacy.

The psychometric properties of the HLQ suggest it is a reliable and valid measure. Different studies have confirmed the HLQ's 9-factor structure, with reported reliability ranges of 0.77 to 0.90 and 0.80 to 0.89 (Elsworth et al., 2016; Kolarcik et al., 2017). A 9-factor CFA model was fitted to the measure items with no cross-loadings or correlated residuals allowed, and the fit was satisfactory: χ 2 WLSMV(866 d.f.) = 2927, $p<0.000$, CFI = 0.936, TLI = 0.930, RMSEA = 0.076, and WRMR = 1.698 (Osborne, Batterham, Elsworth, Hawkins, & Buchbinder, 2013). The HLQ has been adapted into Danish, German, French, and Slovak versions, with all of them showing satisfactory psychometric properties (Debussche et al., 2018). The HLQ has been

used with inpatient and outpatient populations, middle and older adults, with different medical conditions some of which include acute myocardial infractions, diabetes, kidney transplants, and in different settings, not limited to rural and metropolitan hospitals, and community health centers (Jessup et al., 2017; Osborne et al., 2013; Bo et al., 2014; Morris et al., 2017; Aaby et al., 2017; Friis et al., 2016; Demian et al., 2016; Beauchamp et al., 2015; Elsworth et al., 2016). Within this current study, Cronbach's reliability coefficients indicated high internal consistency for each of the 9 domains of the HLQ. Please see Table 1 for more details.

Table 1

Cronbach Values of Health Literacy Domains

Health Literacy Domains	α
HPS Healthcare Provider Support	0.85
HSI Having sufficient information	0.82
AMH Actively managing health	0.80
SS Social support	0.74
CA Critical appraisal	0.86
AE Active engagement with healthcare providers	0.91
NHS Navigating the healthcare system	0.89
FHI Ability to find good health information	0.88
UHI Reading and understanding health information	0.89

Treatment Adherence: Treatment adherence was measured based on appointment attendance and following provider recommendations. Adherence was measured by how often participants attend their treatment appointments and follow their providers recommendations for their chronic pain. Responses are measured with "always," "sometimes," or "never." Treatment recommendations was measured in three parts; fully adherent is if they always attend appointments, partially adherent if they select "sometimes," and nonadherent if they "never" attend appointments. The rating is similar for following provider recommendations, i.e.,

considered fully adherent if they "always" follow provider treatment recommendations, partially adherent if they select "sometimes," and nonadherent if they select "never" (fully adherent 1 = always, partially adherent 2 = sometimes, nonadherent 3 =never). This adherence measure was developed for this study.

Brief Pain Inventory – short form (BPI): The BPI is a short self-report measure that assesses the severity of pain, impact of pain on daily function, location of pain, pain medications, and amount of pain relief in the past 24 hours or the past week. The BPI measures pain interference on a 0 – 10 scale, where 0 = no interference and 10 = interferes completely. It measures pain severity, by assessing pain at its “worst,” “least,” “average,” and “now” (current Pain). It measures pain severity on a 0 – 10 scale, where 0 = no pain 10 = pain as bad as you can imagine. Factor analysis verified pain severity and interference.

The measure shows good internal consistency, ranging from 0.80 to 0.87 for the four pain severity items and from 0.89 to 0.92 for the seven interference items (Cleeland, 1991). The Norwegian translation of the BPI has been tested and Cronbach’s alphas were 0.87 for the pain severity and 0.92 for the interference scales. Also, correlation between BPI pain severity and the European Organization for Research and Therapy of Cancer (EORTC) QLQ-C30 questionnaire item on pain intensity was 0.70 ($p < 0.001$). The correlation between BPI interference index and the EORTC QLQ-C30 item on pain influence on daily living was 0.62 ($p < 0.001$) (Klepstad et al., 2002). The BPI has been used in hundreds of studies worldwide. These studies examined cancer bone pain, cancer pain, depressive disorders, fibromyalgia, HIV/AIDS, minority studies, neuromuscular, and neuropathic pain (Cleeland, 1991). Within this study, Cronbach’s reliability coefficients indicated high internal consistency for the four pain severity items ($\alpha = 0.87$) and for the seven interference items ($\alpha = 0.94$).

RAND 36-Item Short Form Survey: The RAND SF-36 is a self-report measure of the quality of life. It measures eight health concepts, physical functioning, bodily pain, role limitations due to physical health problems, role limitations due to personal or emotional problems, emotional wellbeing, social functioning, energy/fatigue, and general health perceptions. It also provides total composite summary scores for physical and mental health. The physical composite summary score (PCS) is derived from four subscales that have shown to be primarily indicative of physical health, these include: physical functioning, physical role functioning, bodily pain, and general health. The mental composite summary score (MCS) is derived from the other four subscales associated with mental health, they include: vitality, social functioning, emotional role functioning, and mental health).

The RAND is a widely used survey in research to measure the quality of life. It has been used to measure quality of life in clinical outpatient, orthopedic or cardiac rehabilitation, and community center settings, with patients with specific diseases or disabilities such as cancer, heart diseases, and diabetes (Kaplan, 2005). The RAND is a valid and reliable measure with high item-internal consistency (97%) and item-discriminant validity (92%) (McHorney et al., 1994). Combining results from studies also show it has a good median alpha reliability for all scales that exceeds 0.80, except for the two-item social functioning scale (0.76) (McDowell, 2006). Within this current study, Cronbach's reliability coefficients showed good internal consistency in all of the eight health concepts measured by the RAND. Please see Table 2 for more details.

Table 2

Cronbach Values of RAND Domains

RAND Domains	α
Physical functioning	0.93
Role limitation due to physical health	0.89
Role limitations due to emotional problems	0.87

Energy/fatigue	0.80
Emotional well-being	0.86
Social functioning	0.80
Pain	0.82
General health	0.70

Qualtrics: The research software used to collect participant responses to the measures used within the current study. Qualtrics is a cloud-based platform for creating and distributing web-based surveys. It can be used on multiple technological platforms such as phones, computers, and tablets. It is an easy-to-use point and click interface that organizes and exports data in a variety of formats.

Procedure

Participants were recruited through three methods. The first and primary recruitment method was through a list generated by the Director of Whole Person Care at Mercy Health Center, providing only patient names and their contact information. Participants were contacted and informed of the research opportunity then asked if they would be willing to participate for a financial incentive. Once participants agreed to participate and met the inclusion criteria, the informed consent was reviewed, and the participant was assigned an identification number. Participants were then electronically mailed a Qualtrics link to respond to survey questions.

The second recruitment method was through provider-based referrals at Athens Neurological Associates. A medical provider discussed the research opportunity with her patients during their appointments. If patients expressed interest, they were referred to the research team member onsite for consent review and data collection. If there is no researcher onsite, then the patient contact information was shared with the research team for rescheduling. The third recruitment method was through flyers and posters at high-traffic areas like waiting rooms and patient exam rooms at both clinics for patients to contact the research phone number or email.

This method did not yield any results for accessing participants. Importantly, participants were informed of their rights to withdraw from the study at any point and informed that their decision to participate or not participate would not affect the quality of care they receive at either site.

Statistical Analysis

Preliminary Analysis. Prior to running statistical analyses, the study used the checklist for screening data proposed by Tabachnick and Fidell (2018). This includes inspecting univariate descriptive statistics for accuracy of input, addressing missing data, checking for nonlinearity and heteroscedasticity, addressing nonnormal variables and outliers, and evaluating variables for multicollinearity and singularity. Similarly, their work also emphasizes the importance of evaluating assumptions when running a Regression. As such, these assumptions were evaluated applying the steps described by Tabachnick and Fidell (2018). Descriptive statistics were examined to determine participant demographics and descriptive analysis (e.g., mean, standard deviation, range) was conducted for all study variables to characterize the sample. The distribution of the data was inspected prior to analyses to determine whether transformation procedures were needed.

Prior to conducting study analysis, a principal component analysis was conducted on the health literacy questionnaire due to high intercollinearity among health literacy variables and need to meet assumptions needed for a regression analysis. The result of the PCA was two factors of health literacy that were then used for data analysis. Additionally, bivariate correlational analysis was deemed appropriate to examine the relationships between health literacy, chronic pain characteristics, quality of life and adherence (recommendations and treatment adherence) (Perinetti, 2019).

Linear regression models were conducted to estimate the independent relationship between health literacy factors and pain disability, pain severity, and quality of life while adjusting for covariates. Covariates were determined using correlational analysis for dichotomous variables and ANOVAs for categorical variables. Models were run with and without the covariates. Due to the absence of significant relationship between health literacy and treatment adherence, there were no linear regression models used to estimate the relationship between health literacy and treatment adherence.

In the current study, the independent variable was health literacy, and the dependent variables were treatment adherence (appointments and recommendations), pain disability, pain severity, and quality of life. All statistical analyses were conducted using IBM Statistical Package for the Social Sciences, Version 29.0 (SPSS; IBM Corp., Armonk, NY). For hypothesis testing, statistical significance was assumed when $p < .05$.

CHAPTER 4

RESULTS

Data Screening

A total of 67 participants completed the study measures using a Qualtrics-based survey. All data were assessed for accuracy, plausibility of values, and frequency and patterns of missing data using SPSS (SPSS IBM Corp, 2016). Plausibility was assessed by examining minimum values, maximum values, means, and standard deviations. No cases were eliminated for questions of plausibility. The distributions of variables were also examined for skewness and kurtosis. Most variables appeared to be normally distributed or normal-like; however, the RAND and adherence questionnaires were skewed. For the RAND, the physical composite summary scores were positively skewed, with a skewness of 1.08 (*SE* = .36) and kurtosis of -.27 (*SE* = .71). The kurtosis value suggests a normality with this distribution (George & Mallory, 2010). The RAND PCS was transformed using logarithmic transformation (log 10) and the resulting values were used throughout the analysis.

The adherence questions were also positively skewed with a skewness of 1.04 (*SE* = .36) and kurtosis of 4.46 (*SE* = 0.71) for treatment appointments adherence and 1.29 (*SE*= .36) and kurtosis of .73 (*SE* = .71) for treatment recommendations adherence. Their kurtosis value suggests these variables are normal univariate distribution (George & Mallory, 2010). Given the skewness, the data was transformed using logarithmic transformation (log 10) and then subsequently used throughout the analysis. The data was reviewed for outliers, with no specific outliers identified.

Preliminary data analyses revealed good internal consistency for all measures, however the HLQ showed high correlation within its domains which violated the assumptions of no multicollinearity needed for planned parametric statistics, see Table 3 for the correlation matrix. To address the strong intercorrelations among HLQ domains, a Principal Components Analysis (PCA) was conducted, and the results identified two factors that were used as health literacy factors. The two factors identified are consistent with the two categories within the HLQ questionnaire and are discussed further in the *Health Literacy* results section (Osborne et al., 2013).

Table 3

Bivariate Correlation Matrix of HLQ Domains

	HPS	HSI	AMH	SS	CA	AE	NHS	FHI	UHI
HLQHPS	1	.67**	.49**	.55**	.50**	.56**	.53**	.48**	.38**
HLQHSI	.67**	1	.64**	.55**	.67**	.65**	.59**	.63**	.63**
HLQAMH	.49**	.64**	1	.33**	.58**	.25	.24	.34**	.34**
HLQSS	.55**	.55**	.33**	1	.49**	.35**	.38**	.24	.23
HLQCA	.50**	.67**	.58**	.49**	1	.43**	.28*	.46**	.40**
HLQAE	.56**	.65**	.25	.35**	.43**	1	.80**	.67**	.61**
HLQNHS	.53**	.59**	.24	.38**	.28*	.80**	1	.63**	.53**
HLQFHI	.48**	.63**	.34**	.24	.46**	.67**	.63**	1	.75**
HLQUHI	.38**	.63**	.34**	.23	.40**	.61**	.53**	.75**	1

Sample Characteristics

Chronic Pain. All 67 participants self-reported their primary pain problem. Twenty-eight (41.8%) participants identified back pain as their primary pain; 17 (25.4%) participants reported arthritic pain; 9 (13.4) participants reported headaches/migraine; 7 (10.4%) participants reported neuropathic pain; 5 (7.5%) participants reported multisite pain; and 1(1.5%) participant reported fibromyalgia.

Table 4

Frequency of Participant Report of Primary Pain Lasting Over 3 Months

Primary Pain	*N*	*%*
Headaches/Migraine	9	13.4
Back pain	28	41.8
Neuropathic pain	7	10.4
Fibromyalgia	1	1.5
Arthritis	17	25.4
Multisite pain	5	7.5

Note. N= number of participants

Sociodemographic Variables. The average age of the participants was 48.7 years old (range = 21 – 69). Regarding gender, 47 participants (70.1%) identified as female and 20 (29.9%) identified as males. The sample consisted primarily of participants who self-identified as White (68.2%, *n* = 45); 12 (18.2%) participants identified as African American; 3 (4.5%) participants identified as Hispanic/Latino; 1 (1.5%) identified as Native American; 1 (1.5%) identified as Asian American participant 1 (1.5%); 1 (1.5%) identified as Biracial; and 1 (1.5%) as a Pacific Islander.

Relationship status was reported as follows, single (22.4%, *n* = 15), married or partnered (47.8%, *n* = 32), divorced or separated (25.4%, *n* = 17), and widowed (4.5%, *n* = 3). The majority of participants identified their sexual orientation as heterosexual (89.4%, *n* = 59), 1 (1.5%) as Gay, 1 (1.5%) as Bisexual, 1 (1.5%) as and Pansexual. Regarding highest level of education, some participants reported completing some high school but had not earned a high-school diploma (28.8%, *n* = 19), others completed high school or obtained their GED (28.8%, *n* = 19), 27.3% (*n* = 18) completed some college but did not finish, and 15.2% (*n* = 10) completed college or postgraduate degrees.

Regarding employment status, 25 (37.9%) participants reported working a full-time job or position as a student. 27 (40.9%) participants reported being unemployed due to disability. 14 (21.2%) identified that they were unemployed for other reasons. The current sample can be said to capture a low-income population given that 64.2% (n = 43) of participants reported making less than $20,000 yearly. The other 24 participants (34.8%) reported making over $20,000 a year, and 16 of the 24 participants reported making between $20,000 - $34,999 a year. Regarding the number of people in the household, 2 (3%) participants identified as homeless, 15 (22.4%) participants reported they live with themselves, 26 (38.8%) indicated they lived with at least one other person, 13 (19.4%) lived with at least three people in the home, and 11 (16.4%) identified that they lived with over four people.

Table 5

Sociodemographic Characteristics of Participants at Baseline

Demographic characteristic	*N*	*%*
Gender		
Female	47	70.1
Male	20	29.9
Race		
Black	12	18.2
White	45	68.2
Native American	1	1.5
Asian	1	1.5
Biracial	1	1.5
Hispanic/Latino	3	4.5
Pacific Islander	1	1.5
Other (Human)	2	3.0
Relationship status		
Single	15	22.4
Married/partnered	32	47.8
Divorced/separated	17	25.4
Widowed	3	4.5
Sexual Orientation		
Heterosexual	59	89.4
Gay or lesbian	1	1.5
Bisexual	1	1.5

Pansexual	1	1.5
Other (yes)	4	6.1
Highest educational level		
Some high school	19	28.8
Completed high school/ GED	19	28.8
Some college	18	27.3
University or postgraduate degree	10	15.2
Employment		
Employed/Student	25	37.9
Unemployed due to disability	27	40.9
Unemployed for other reasons	14	21.2
Household Income		
Less than $20,000	43	64.2
Over $20,000	24	34.8
Number in Household		
Homeless	2	3.0
Self	15	22.4
Two	26	38.8
Three	13	19.4
>Four	11	16.4

Note. N = 67 Participants were on average 48.72 years old (SD = 11.86)

Chronic Pain Outcomes

The mean BPI Severity was 6.24 (SD = 1.84, range = 1.25 to 10) which is comparable to average pain reports in other chronic pain studies involving primary care patients and inpatient or outpatient rehabilitation patients (Rambla et al., 2023; Boonstra et al., 2016).

The mean BPI interference was 6.30 (SD = 2.59, median = 6.64, range = .14 to 10) and suggests that the functional status of participants is significantly impaired by their pain. This level of BPI interference is also comparable to other studies assessing disability in primary care patients and those with chronic pain patients who attend a pain center clinic (Stubbs et al., 2010; Fujiwara et al., 2021).

Participants scores on eight subscales of the RAND quality of life measure are shown in Table 3. The composite summary scores of RAND subscales were derived to form a physical composite summary (PCS) and mental composite summary (MCS) score. For the PCS, results showed most participants reported worse physical functioning (*M* = 30.4 *SD* = 20.50) which is comparable to other studies looking at chronic pain population (Henry et al., 2018). For the MCS, participants reported worse mental health functioning (*M* = 40.13 *SD* = 22.42 which is comparable to chronic pain populations (Morris et al., 2023). See Table 6 for means and standard deviations for RAND subscales.

Table 6

Summary of Means and Standard Deviations for RAND subscales

	N	*M*	*SD*
Physical functioning	61	35.2	29.2
Role limitations due to physical health	62	20.16	34.7
Role limitations due to emotional problems	62	34.4	42.7
Energy/fatigue	64	30.2	18.5
Emotional well-being	65	50.5	23.6
Social functioning	65	46.9	26.9
Pain	66	31.7	18.9
General health	65	37.5	18.6
Physical Composite	57	30.40	20.50
Physical Composite Log	57	1.38	.32
Mental Composite	61	40.13	22.42

Health Literacy Results

The mean and standard deviations of participant reports of health literacy can be seen in Table 7.

Table 7

Summary of Means and Standard Deviations for Health Literacy Questionnaire

	N	*M*	*SD*
HLQHPS	64	3.04	.62
HLQHSI	63	2.76	.59
HLQAMH	64	2.88	.49
HLQSS	65	2.96	.57
HLQCA	63	2.83	.57
HLQAE	63	3.43	.89
HLQNHS	65	3.18	.84
HLQFHI	64	3.46	.85
HLQUHI	65	3.75	.82
Valid N (listwise)	57		

A principal components analysis (PCA) was conducted on the 44-item health literacy questionnaire. The suitability of PCA was assessed prior to analysis. Inspection of the correlation matrix showed that all variables had at least one correlation coefficient greater than 0.3. The overall Kaiser-Meyer-Olkin (KMO) measure was 0.83 with individual KMO measures all greater than 0.75, classifications of 'middling' to 'meritorious' according to Kaiser (1974). Bartlett's test of sphericity was statistically significant ($p < .001$), indicating that the data was likely factorizable.

PCA revealed two components that had eigenvalues greater than one and which explained 57.90% and 13.42%of the total variance, respectively. Visual inspection of the scree plot indicated that two components should be retained (Cattell, 1966). In addition, a two-component solution met the interpretability criterion. As such, two components were retained. The two-component solution explained 71.31% of the total variance. A Varimax orthogonal rotation was employed to aid interpretability. The rotated solution exhibited 'simple structure' (Thurstone, 1947).

The interpretation of the data was consistent with the health literacy characteristics the questionnaire was designed to measure. Component 1 (Extrinsic Health Literacy skills) had strong loadings of the active engagement with healthcare providers, navigating the healthcare system, ability to find good health information, and reading and understanding health information domains. This component captures people's ability to be proactive about their health, access health services, support, and health information, advocate for themselves, and read and write.

Component 2 (Intrinsic Health Literacy skills) had strong loadings of the healthcare provider support, having sufficient information, actively managing my health domain, social support, and critical appraisal domains. This component looks at internal factors necessary for health literacy. It is the underlying factor across those who have an established relationship with a healthcare provider they trust, feel confident in the information that they have, understand the importance of health and healthcare decision making, have a good support system, and can understanding conflicting health information.

Table 8

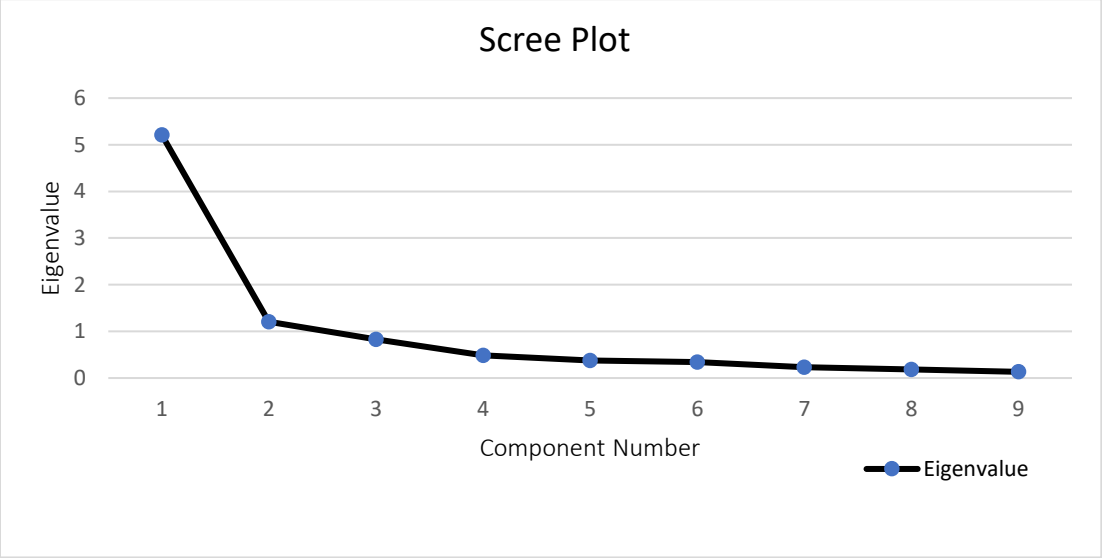
Rotated Structure Matrix for PAC with Varimax Rotation of a Two Component Questionnaire

Items	Rotated Component Coefficients	
	Component 1	Component 2
HLQAE	**.88**	
HLQNHS	**.85**	
HLQFHI	**.81**	
HLQUHI	**.78**	.30
HLQAMH		**.84**
HLQCA		**.78**
HLQHSI	.55	**.73**
HLQHPS	.42	**.68**
HLQSS		**.67**

Note. Major loadings for each item are bolded

Figure 1

Scree Plot



Adherence Results

For the adherence measure, most participants reported always attending their scheduled treatment appointments for their chronic pain (M = 1.60 SD = .78). Most participants also reported always following their providers treatment recommendations (M = 1.34 SD = 1.34). The high report of consistent adherence resulted in a more positively skewed distribution of the adherence measure.

Results

Hypothesis 1. Participants who report lower scores across health literacy domains will report higher pain severity scores.

A Pearson's product-moment correlation was conducted to assess the relationship between health literacy factors and pain severity. Appendix E shows the correlation matrix that was computed with pain severity, pain disability, and health literacy domains. The bivariate correlation between extrinsic health literacy skills and pain severity showed that there was a

statistically significant, negative correlation between extrinsic health literacy skills and pain severity (r = -.34, p < .01). There was no statistically significant correlation between intrinsic health literacy and pain severity (p > .05). This suggests individuals who reported being proactive about their health, ease in accessing health services, support, and health information, and abilities to advocate for themselves, and read and write, reported lower pain severity. See Table 9.

Hypothesis 2. Participants who report higher scores across health literacy domains will report lower levels of pain disability.

The bivariate correlational analysis was conducted to determine the relationship between health literacy factors, EHL and pain disability. Results indicated there was a statistically significant relationship between the extrinsic health literacy domains and pain disability (r = -.33, p = .01). There was no statistically significant correlation between intrinsic health literacy and pain severity (p > .05). This suggests individuals who reported being proactive about their health, ease in accessing health services, support, and health information, and abilities to advocate for themselves, and read and write, reported lower pain disability. See Table 9.

Hypothesis 3. Participants who report higher scores across health literacy domains will have a higher quality of life.

A bivariate correlational analysis was conducted to determine the relationship between health literacy, health literacy factors and quality of life. The correlations between health literacy domains and RAND PCS Log and MCS can be seen in Appendix E.

For the RAND PCS Log, there was a statistically significant correlation between extrinsic health literacy factors and physical functioning (r = .34, p = .02). There was no statistically significant correlation between intrinsic health literacy and physical functioning (p > .05). For

the RAND MCS, there was a statistically significant correlation between extrinsic health literacy skills and mental well-being (r = .35, p = .02). There was a statistically significant correlation between intrinsic health literacy skills and mental well-being (r = .43, p = .02). This suggests individuals who reported being proactive about their health, ease in accessing health services, support, and health information, and abilities to advocate for themselves, and read and write, reported better physical and emotional functioning. See Table 9.

Hypothesis 4. There is a statistically significant negative correlation between health literacy domains and following provider recommendations about chronic pain.

Results showed there were no statistically significant relationships between the health literacy domains and adherence to following providers treatment recommendations for chronic pain ($p > .05$) see Table 8 for the correlation matrix. Similarly, a correlation between extrinsic health literacy skills and adherence to provider recommendations showed there was no statistically significant relationship between both variables ($p > .05$). There was also no statistically significant relationship between intrinsic health literacy skills and adherence to following providers treatment recommendations for chronic pain.

Hypothesis 5. This study estimated a statistically significant negative correlation between health literacy and attending treatment appointments for chronic pain.

Results showed there were no statistically significant relationships between the health literacy domains and adherence to treatment appointments for chronic pain ($p > .05$) see Table 8 for the correlation matrix. Similarly, a correlation between extrinsic health literacy skills and adherence to treatment appointments showed there was no statistically significant relationship between both variables ($p > .05$). There was also no statistically significant relationship between intrinsic health literacy skills and adherence to treatment appointments.

Table 9

Summary of Correlations between Two Health Literacy Components and Study Outcomes

	EHL	IHL
SEV	-.34**	-.22
INT	-.33*	-.21
PCSLOG	.34*	.27
MCS	.35*	.43**
ADH1LOG	.12	.01
ADH2LOG	-.06	.16

Note. **Correlation is significant at the .01 level (2-tailed); * Correlation is significant at the .05 level (2-tailed) (SEV = BPI Severity; INT = BPI Interference; ADH1LOG = Adherence to recommendations; ADH2LOG = Adherence to treatment appointments)

Analysis of Covariates for Regression Analysis

A Pearson's product-moment correlation was conducted to assess the relationships among the age, gender, race, education, number in household, and income and study variables, health literacy, pain disability, pain severity, quality of life, and adherence. A one-way ANOVA was used to compare the differences between employment status and number in household and study variables. Statistical significance was determined at the $p < .02$ level to reduce the occurrence of type 1 errors.

Age. Results showed a negative correlation between age and adherence to provider treatment recommendations ($r = -.40$, $p = .002$). This is consistent with research that suggests a relationship between age adherence to treatment appointments in a free clinic (Panahi et al., 2022)

Gender. Results of a correlational analysis showed there was no statistically significant relationship between gender and the study variables.

Race. Due to the high percentage of participants identifying as White (68.2%), race was dichotomized to White and BIPOC**.** Results of a correlational analysis showed there were no statistically significant relationships between race and the study variables.

Education. The education variable was dichotomized to at high school level and over high school. The results of a correlational analysis showed there were no statistically significant relationships between education and the study variables.

Number in Household. A one-way ANOVA was used to compare the relationship between number in household and study variables. There were no significant group differences found.

Income. Income was transformed to a bimodal variable to see differences between those who make either over or under $20000. There were no significant correlations between income and study variables.

Employment Status. A one-way ANOVA was used to compare the relationship between the employment status and study variables. Results showed there were differences in RAND MCS [F (2, 57) = 6.81 p = .002] and the RAND PCS Log [F (2, 53) = 15.02 p < .001]. More differences were seen between employment status and pain disability [F (2, 62) = 5.79 p <= .005]. There were also differences in the adherence to treatment appointments [F (2, 54) = 7.52 p = .001]. This is consistent with research that shows a relationship that employment status and health are inextricably linked and have a direct impact on life expectancy and quality of life (Andreu et al., 2023; Water et al., 2006).

Regression Analysis of Correlations with Covariates

To further assess health literacy as a predictor of chronic pain outcomes in the context of covariates, linear regressions were used to analyze the components of health literacy as

predictors on pain severity, pain disability, and quality of life (QOL). Covariates included age and employment status.

Pain Characteristics Outcomes

With regard to assumptions, there was linearity as assessed by partial regression plots and a plot of studentized residuals against the predicted values. There was independence of residuals, as assessed by a Durbin-Watson statistic of 2.16 for pain severity and 2.04 for pain disability. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. There were no studentized deleted residuals greater than ±3 standard deviations, no leverage values greater than 0.2, and values for Cook's distance above 1. The assumption of normality was met, as assessed by a Q-Q Plot (Laerd Statistics, 2015).

Pain Severity. The results of preliminary correlational analysis showed a statistically significant relationship between the extrinsic health literacy factor and pain severity. A significant regression equation was found [F (2,54) = 5.42, p = .007], with an R^2 of .17 and showed that the model significantly predicted pain severity. The R^2 of .17 indicated that 17% of the proportion of variability in pain severity can be accounted for by the model. Extrinsic health literacy was a significant predictor of pain severity and an increase in extrinsic health literacy abilities is associated with a decrease in pain severity, b = -.62, t(52) = -2.77, p = .008. Notably, the extrinsic health literacy skills component was a significant predictor of pain severity, suggesting that an increase in a person's ability to engage with external resources, self-advocate, find health information, and literacy skills would be associated with a decrease in pain severity.

Table 10

Multiple Regression Analysis Summary for Variable Predicting Pain Severity

Variable	B	Standard Error of B	β
EHL	-.62	.22	-.34**
IHL	-.40	.22	.22

Note. R^2 = .17; F (2,54) = 5.42, p = .007. *p< .05; **p< .01, ***p< .001.

Pain Disability. The results of preliminary correlational analysis showed a statistically significant relationship between the extrinsic health literacy factor and pain severity. The extrinsic factor along with the covariate of employment was entered into a regression model. A significant regression equation was found [F (3,52) = 3.27 p = .03], with an R^2 of .16 and showed that the model significantly predicted pain disability. The R^2 of .16 indicated that 16% of the proportion of variability in pain severity can be accounted for by the model. Extrinsic health literacy was a significant predictor of pain severity and an increase in extrinsic health literacy abilities is associated with a decrease in pain severity, b = -.84, t(52) = -2.57, p = .01.

Table 11

Multiple Regression Analysis Summary for Variable Predicting Pain Disability

Variable	B	Standard Error of B	β
EHL	-.84	.33	-.33*
IHL	-.53	.33	-.21
Employment Status	.21	.26	.10

Note. R^2 = .16; F (3,52) = 3.27 p = .03. *p< .05; **p< .01, ***p< .001.

Quality of Life Outcomes

A linear regression was run to predict extrinsic health literacy from employment status. With regard to assumptions, there was linearity as assessed by partial regression plots and a plot of studentized residuals against the predicted values. There was independence of residuals, as

assessed by a Durbin-Watson statistic of 2.22 for RAND MCS and 1.91 for RAND PCS LOG. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. There were no studentized deleted residuals greater than ±3 standard deviations, no leverage values greater than 0.2, and values for Cook's distance above 1. The assumption of normality was met, as assessed by a Q-Q Plot (Laerd Statistics, 2015).

RAND MCS. The results of preliminary correlational analysis showed a statistically significant relationship between some of the health literacy domains and RAND MCS. Those significant domains, along with covariates of employment were entered into a regression model. Results showed that the model significantly predicted mental health functioning [F (3, 48) = 7.67, $p < .001$], with an adjusted R^2 of .32. The R^2 of .32 suggests that 32% of the proportion of variability in mental health functioning can be accounted for by the model. Extrinsic health literacy was a significant predictor of mental functioning suggesting an increase in extrinsic health literacy abilities is associated with an increase in mental health functioning and quality of life, $b = .35$, $t(46) = -2.97$, $p = .005$. Intrinsic health literacy was also found to be a significant predictor of mental functioning $b = .42$, t (46) = 3.53, $p < .001$.

Table 12

Multiple Regression Analysis Summary for Variable Predicting Quality of Life -MCS

Variable	B	Standard Error of B	β
EHL	7.41	2.50	.35**
IHL	9.28	2.63	.42***
Employment Status:	-2.57	2.12	-.14

Note. $R^2 = .32$; F (3, 48) = 7.67, $p < .001$. *$p < .05$; **$p < .01$, ***$p < .001$.

RAND PCS. The linear regression model for the RAND PCSLOG was significant [F (3, 47) = 5.37, $p = .003$] with an adjusted R^2 of .26. The R^2 of .26 suggests that 26% of the

proportion of variability in physical health functioning can be accounted for by the model. Extrinsic health literacy was a significant predictor of mental functioning and suggests an increase in extrinsic health literacy abilities is associated with an increase in physical health functioning and quality of life, $b = .34$, $t(45) = 2.69$, $p = .01$. Intrinsic health literacy was also found to be a significant predictor of physical health functioning $b = .26$, $t(45) = -2.05$, $p < .05$. This suggests an increase in intrinsic health literacy abilities is associated with an increase in physical health functioning. Employment status was also found to be a significant predictor of physical health functioning $b = -.26$, $t(45) = -2.05$, $p < .05$. These results suggested that an increase in unemployment status, i.e., being unable to work due to disability or other reasons, would be associated with a decrease in physical health functioning.

Table 13

Multiple Regression Analysis Summary for Variable Predicting Quality of Life -PCS LOG

Variable	B	Standard Error of B	β
EHL	.10	.04	.34*
IHL	.08	.04	.26*
Employment Status:	-.07	.03	-.26*

Note. $R^2 = .26$; $F(3, 47) = 5.37$, $p = .003$. *$p < .05$; **$p < .01$, ***$p < .001$.

CHAPTER 5

DISCUSSION

Chronic pain is a significant public health concern that negatively impacts both individuals and the healthcare system. It is one of the leading causes of disability and has been shown to have a significant negative effect on quality of life, physical, and emotional functioning (Vos et al., 2017; Antonaci, Nappi, Manzoni, & Calabresi, 2011). Given the multidimensional nature of chronic pain, it requires a biopsychosocial when considering interventions. Currently there are a variety of biological and psychological treatments for chronic pain, with many of the psychological treatments showing efficacy for reducing pain, but health disparities exist in the treatment and outcomes of chronic pain (AHRQ, 2019).

Health disparities are influenced by social determinants of health such as race, socioeconomic status, and health literacy. It captures the reality that those who hold certain identities may experience barriers when accessing healthcare and overall reduced quality of care. When considering health disparities, many of the factors found to affect health outcomes can be clustered around patient, provider, and systemic/contextual factors, showing the intersectionality that occurs between different variables to influence health outcomes.

Andersen et al, proposed a model that describes multiple factors that influence perceived health status and patient-provider interactions. The factors include individual factors that determine healthcare access and utilization, predisposing factors that influence whether people use health services, and enabling factors that influence health service use and effective health behaviors (Andersen et al., 2011). A shared similarity among all these factors are social

determinants like education and income, suggesting the significance of socioeconomic status and health literacy in treatment outcomes. Notably, evidence suggests that poor health literacy has been shown to negatively affect predicted mortality, frequency of hospitalizations, medication and treatment adherence, and overall health status (Baker et al., 2007; Berkman et al., 2011; Nutbeam, 2008). While there is supporting evidence for the benefits of health literacy in chronic pain treatment outcomes, there are inconsistencies among study findings, suggesting the relationship between health literacy and chronic pain still needs to be clarified.

This study, along with others, is arguing that limitations are occurring in research due to the use of a limited measure of health literacy. Many research studies have measured health literacy as reading, writing, and numeracy abilities in understanding health information, but this merely captures the full breadth of health literacy, which includes knowledge and functional abilities to apply that knowledge. This study makes the case that an expanded definition of health literacy could offer more information about the relationship between health literacy and chronic pain self-management behaviors, as well as chronic pain treatment outcomes. More specifically, an expanded definition of health literacy will inform on which aspects to focus on when developing treatment interventions to improve treatment adherence and chronic pain outcomes like pain severity, disability, and quality of life in underserved populations.

In considering the noted literature and theoretical model described, the present study aimed to examine the relationship between health literacy and pain self-management behaviors like treatment adherence and attending treatment appointments. It also aimed to better understand the relationship between health literacy and chronic pain outcomes like pain related disability, severity, and quality of life.

Study Findings

Results of the study supported the first hypothesis, such that participants who scored lower on extrinsic health literacy reported higher pain severity scores. Specifically, extrinsically related health literacy skills had a significant negative correlation with pain severity. Results suggests that individuals who can find services and advocate for themselves, are able to identify reliable sources of information, feel empowered and in control with healthcare providers, actively use diverse resources, can understand written information and write well enough to complete medical forms report lower pain severity (Osborne et al., 2013). These findings are consistent with studies that show that different aspects of health literacy skills are associated with less pain intensity.

To illustrate, one study found that patients' confidence in filling out forms and ability to learn about their condition because they understand written information was related to less pain intensity (Köppen et al., 2017). This study's findings are in line with research that suggests literacy skills have a role to play in pain intensity. Another study investigating the role of multimedia pain management education on pain intensity found significant differences in pain intensity between the group that received pain management education and the control group (Shaygan et al., 2022). Also, brief educational programs have been shown to be helpful in reducing pain intensity in chronic cancer pain patients (Allard et al., 2001). This suggests significant benefits to patient's perceived pain intensity when they can access pain related information.

One study that piloted a chronic pain empowerment and self-management platform that offered patient coaching, education, and provider guidance, showed significant improvements in pain intensity and disability for participants who received the intervention (Sullivan et al., 2018).

While this study did not assess health literacy factors, their interventions targeted extrinsically related health literacy skills and show their significance in improving pain intensity. Another study that offered early access to a physical therapy treatment showed those who received earlier treatment reported greater improvement in their perceived pain (Nordeman et al, 2006). These findings support the study's conclusion that extrinsically related health literacy skills that involves a patient's ability to understand information, access information, access resources, and feel empowered in their interactions with the healthcare system is associated with perceived pain intensity.

Hypothesis 2 was found to be significant and participants who scored lower on extrinsic health literacy reported higher pain disability. Specifically, extrinsically related health literacy skills had a significant negative correlation with pain disability. The results suggested that higher levels of active engagement with healthcare providers, navigating the healthcare system, ability to find good health information, and reading and understanding health information are associated with lower pain disability reports. This study's findings suggest participants who feel in control in relationships with healthcare providers, feel confident that they can find and have all the information they need to manage their health, are proactive about their health, and understand health information report less pain interference in their ability to engage in daily tasks (Osborne et al., 2013).

These findings are consistent with research that shows specific aspects of extrinsically related health literacy skills are associated with pain disability. Specifically, one study found that more positive perceptions of provider communication was related to lower levels of pain intensity and disability, however the relationship was mediated by levels of self-efficacy (Ruben, Meterko, & Bokhour, 2018). Another study investigating the effectiveness of a culturally

tailored online intervention targeted chronic pain related health literacy and empowerment by providing health education. The study found significant positive changes to participant knowledge, self-efficacy, and pain disability (Pagan-Ortiz & Cortes, 2021). These studies support current study findings that patient perception of their relationship with their health care providers and ability to access health information is beneficial for improving pain disability outcomes.

Interestingly, another study looking at the effectiveness of education interventions in people with low literacy levels showed there was a moderate effect of the interventions on both knowledge and self-efficacy (Lowe et al, 2013). This relationship with health literacy and self-efficacy is also supported by studies that show lower literacy levels are associated with lower pain-related self-efficacy (Kapoor, Eyer, & Thorn, 2016). Consequently, when considering this current study's findings that participants who reported a low sense of empowerment and control in interactions with healthcare providers reported higher pain disability, the results are consistent with research that shows self-efficacy i.e., sense of control over behavior change, plays an indirect role in pain health outcomes (Street, 2013). This further highlights the multidimensional aspects of health literacy skills and that increasing certain health literacy skills in chronic pain patients would show benefits for pain knowledge, patient satisfaction in provider interaction, and increasing their sense of self-efficacy.

Results were significant for hypothesis 3 as well. The extrinsically related health literacy skills were significantly correlated to quality of life. Specifically, extrinsically related health literacy skills had a significant positive correlation with physical well-being. Where those who report feeling empowered, confident in their ability to self-advocate, access, and understand health information, reported better physical health functioning (Osborne et al., 2013). For mental

health functioning, the results showed that all aspects of health literacy were significantly related to emotional well-being. The results suggested in addition to the extrinsically related health literacy skills, individuals who have an established relationship with a healthcare provider they trust, feel confident they can manage their condition using information they have, have a good support system, are able to obtain the needed amount of health information, while being able to discern conflicting details and are active in their health management, report better mental health functioning (Osborne et al., 2013).

Currently, the research on the relationship between health literacy and quality of life is inconclusive. Some studies show an association between health literacy and physical and mental components of quality of life, while others do not (Mehralian et al, 2023; Montbleau et al., 2017; Couture et al., 2017). The findings of this study are in line with research that shows health literacy has a significant association with the mental health component of quality of life (Song et. al., 2012). Notably Song and colleagues did not find a relationship with physical functioning, but their measure of health literacy was a word item recognition test, which strictly measures functional health literacy skills (Song et. al., 2012). This might suggest broader health literacy skills are related to mental well-being, but physical functioning may involve other aspects of health literacy.

Furthermore, another study that identified that quality of life was significantly associated with communication skills, knowledge of dealing with health problems, and knowledge of one's own physical condition (Haack et al, 2020). Such findings show that health literacy has different dimensions with which it influences quality of life. As an example, one meta-analysis showed health skills had the highest correlation with overall quality of life and suggested there were significant benefits to being able to transform health knowledge to healthy behaviors (Zheng et

al., 2018). Overall, these findings show that all aspects of health literacy are necessary for mental and physical well-being, but more studies need to be done to clarify the relationship between health literacy and physical versus mental quality of life.

The results of the study did not support hypothesis 4 and 5. When it came to understanding the relationship between health literacy and self-management behaviors like treatment adherence and following providers recommendations for chronic pain management, there was no relationship found. These results are consistent with the mixed nature of research on the relationship between health literacy and adherence. Some research studies show individuals with inadequate health literacy often have difficulty following medical recommendations and attending their follow-up appointments, while others do not (Rogers et al., 2020; Comings, Reder, & Sum, 2001).

In an effort to further understand the relationship between health literacy and chronic pain outcomes, multiple linear regression analysis was used. The results showed that extrinsic health literacy skills (i.e., skills needed for actively managing one's health and navigating the healthcare system and health information gathering) is a significant predictor of pain severity and pain disability when assessed against other factors known to impact chronic pain (employment). This suggests that health literacy does play a significant role in the prediction of chronic pain related outcomes. It also suggests that both extrinsic and intrinsic health literacy skills play a predictive role in mental health functioning.

Overall, the findings of this study show that in a chronic pain population, some aspects of health literacy are more significant than others in determining pain characteristics like pain severity and disability. In this case, extrinsically related health literacy skills (active engagement with healthcare providers, navigating the healthcare system, finding health information, and

understanding health information) were found to have significant predictive relationships with pain severity and disability. This finding is consistent with the health literacy model proposed by Nutbeam, where he makes the argument that not all health literacy levels are the same.

Nutbeam argues that there are three levels of health literacy, functional, interactive, and critical health literacy skills, and these different levels of health literacy allow for greater autonomy, personal empowerment, and affect health behavior outcomes (Nutbeam, 2000). When applying these levels in the context of pain, the functional health literacy skills are the basic skills in reading, writing, and numeracy skills needed obtain heath information regarding pain. Interactive health literacy involves advanced cognitive, literacy, and social skills used to actively participate in activities, extract information, and apply that information to changing one's experience of pain. This element of health literacy involves both knowledge acquisition, communication skills, problem solving abilities, and health decision making abilities. Finally, critical health literacy involves a combination of both functional and communicative skills to critically analyze chronic pain information and apply it to one's unique situation (Nutbeam, 2000).

When considering the study's findings with this model, the extrinsic component of health literacy that was identified in this study is comparable to interactive health literacy skills. Both components share similarities as they involve personal capacity to self-advocate, gain access to resources, gain a sense of control, problem solve and utilize literacy skills to obtain health information and better healthcare decision making. Improving interactive literacy will help with improving personal capacity to act independently on knowledge, which in turn yields benefits for self-management behaviors (Chen et al., 2021). Nutbeam also argues that focusing on interactive literacy will help increase consumer engagement with obtaining health information and is linked

to individual benefits (2000). Considering this study's findings and previous research, interactive literacy skills are central in self-management and highlight their importance in health promotion within a chronic pain population.

People with chronic pain frequently interact with the health care system, so targeting interactive health literacy through interventions implemented at the individual, family, hospital, community, and government level will help increase the ability to function independently, increase motivation, and boost self-confidence for those with chronic pain. The findings of this study highlight the significance of a person's interaction with the healthcare system and how it can significantly influence their pain severity and pain disability. It shows that people who feel they can share their concern with healthcare providers, feel informed about services and supports, can easily access information, and have good literacy skills are more likely to report better pain severity and reduced disability. These findings reinforce that there are multidimensional factors that affect chronic pain management and outcomes (Andersen et al., 2011). It shows that interpersonal and systemic factors can have a lasting impact on the pain experience for chronic pain patients and highlights the need to target interventions towards these areas. The findings also suggest that all aspects of health literacy are fundamental to overall mental health functioning, so patient needs and skills need to be targeted to improve their perceived quality of life.

Notably, the findings of this study show that functional literacy is still of great importance and that health literacy levels are influenced by cognitive development and a person's ability to read and comprehend the health information they acquired. This finding is in support of research that shows individuals with undeveloped skills in reading and writing will have less exposure to health and medical information, as well as less developed skills to act upon

the information received (Nutbeam, 2000; Protheroe, Nutbeam, & Rowlands, 2009). It highlights that strategies to promote health literacy will ultimately involve strategies that promote functional literacy skills.

When considering the results, it is important to understand characteristics of the sample. The current sample was recruited from two community clinics, with one treating medically uninsured members of the Athens, GA community. The patient population was comparable to other studies regarding pain severity and disability. The quality-of-life reports were comparable for physical quality of life, but this sample reported slightly better quality of life than most chronic pain samples. Additionally, as a whole, this sample reported moderate pain severity.

Considering the variable being studied was health literacy, it is important to understand the health literacy of the sample assessed to contextualize these findings. The results showed that many participants agreed that they felt understood and supported by their healthcare providers. The average response fell in the disagree to agree range for having sufficient information to live with and manage my health. These results suggest study participants have had considerably satisfying interactions with the healthcare system but require additional systemic support regarding information for health management.

Participant responses fell in the disagree to agree range, with more participants agreeing that they proactively engage in their own care and decision making about their health. Most participants agreed that their social support system provided them with all the support that they want or need. Participants reported they agree with being able to identify good and reliable sources of information independently or with help from others appraisal of health information. These findings suggest that the health literacy skills and needs of this population were in the moderate to high range.

The second domain of the health literacy questionnaire showed that study participants had difficulty proactively seeking information, advice, or service options, along with sharing concerns and asking questions when with healthcare providers. For navigating the healthcare system domain, average scores fell in the sometimes-difficult range and suggest additional weakness areas in advocacy and using the healthcare system to address health needs. Participant scores fell in the sometimes-difficult range for accessing health information when required and suggests participants are dependent on others to offer information. Notably, some participants reported feeling empowered and responded that it is usually easy to be proactive about their health and seek information from health care providers. For the understanding health information domain, participants scores fell closer to the usually easy range, suggesting participants reported being able to understand written or numerical information in relation to their health, as well as confidence in their ability to write appropriately on forms where required.

Implications for Future Research

The findings of this study highlight the importance of patient engagement in providing a high quality of care and show that significance of the impact high patient engagement can have on pain severity and disability. It suggests that there are significant benefits to people feeling empowered to seek health information advice from their healthcare providers. Patient engagement may also help promote understanding between patient and healthcare providers and primary care facilities are a good starting point for increasing engagement. This suggests research and interventions should be directed towards reducing barriers to patient engagement in their healthcare as informed patients are more likely to feel confident in their treatment teams and health decision making. The results are consistent with research that suggests communicative/interactive health literacy is a factor related to patient engagement (Heijmans et

al., 2015). Thus, health literacy strategies should be tailored to the health literacy levels of chronic pain patients to help improve their engagement treatment.

Some of the ways this can be addressed is by developing and applying interventions targeted at increasing patient proactiveness and sense of control in patient-provider relationships. Some areas of interventions could be geared towards providers, so educating providers about the importance of the patient's role and increasing provider clinical competency by teaching communication skills for effective practice. Additionally, educational programs can use health literacy strategies to build engagement, such as offering information brochures, or sharing videos that teach patients how to talk with providers. Also, the role of using information to drive interventions could be helpful, so primary care facilities should obtain retrospective feedback from patients on ways they can improve patient engagement (Sheikh et al., 2016).

Finding health information and understanding health information were also aspects of health literacy that were significantly associated with pain disability and severity. It highlights that the better a person can understand written health information and access it when required, using a range of resources, the better their quality of life, pain severity, and disability. These findings suggest addressing barriers related to patients accessing health information and having resources easily available. Another consideration is the provider factor in patients accessing health information. One study looking at provider needs suggests many providers requested assistance connecting underserved patients to wraparound social services and desired resources to streamline pain education and counseling with patients (Zhang et al., 2023). This shows interventions should be geared towards both patient and providers. Healthcare organizations can dedicate funding towards increasing the resources available and improving information access points for patients that have been identified to have health literacy needs around accessing and

utilizing information or resources. By applying an integrated healthcare approach where medical providers can easily consult or refer to a behavioral health provider, interdisciplinary work can yield benefits for improving chronic pain treatment outcomes and patient satisfaction.

Findings of this study highlight the importance of the patient-provider relationship in patient-centered care and the significance of the impact it can have on a patient's mental health quality of life. It suggests there are significant benefits to providers using communication tools that build patient trust and offer guidance and support with decision making. Research suggests patient-centered care communication tools like solution-oriented messages, using openness, nonjudgement, listening, and communicating trust may be helpful for improving patient sense of provider support and feeling understood (Haverfield et al., 2018). More considerations should be made using these communication tools during provider interaction with individuals who have chronic pain.

When considering chronic pain management behaviors, there are significant benefits to having sufficient information to manage one's pain condition and make decisions about their health. While there was not a relationship found between health literacy and adherence to treatment appointments and provider recommendation, the having sufficient information domain of health literacy was found to have a significant relationship with mental health functioning. It shows the importance of patient confidence in their abilities to manage their health condition and health decision making. This highlights the importance of an individual's sense of self-efficacy and supports the findings on the predictive role of self-efficacy on quality of life (Ferrari et al., 2019; Jackson et al., 2014; Yazdi-Ravanadi e al., 2013). Future research should further investigate the relationship between health literacy and pain self-efficacy.

Additionally, the other variables within the intrinsic factor show that sense of responsibility about one's health, quality social support system, and ability to resolve conflicting health information is predictive of overall mental health functioning. The impact of responsibilities is important, as an excessive number of responsibilities can lead to stress and mental health issues, yet increased sense of responsibility for health has been associated with greater knowledge about health-related activities (Jaworski, Adamus, & Bojar, 2016). This suggests there are benefits to forming this behavior in patients as it is an important element of health education, could influence their health-related behaviors and mental health functioning, and is potentially helpful in increasing the effectiveness of lifestyle modification interventions.

The differences in findings between the health literacy extrinsic and intrinsic factor, suggests that when it comes to pain disability and pain severity, a person's interaction with the healthcare system, their sense of control, literacy skills, and access to information and resources, is much more significant in predicting their chronic pain severity and disability, than their intrinsic health literacy skills like beliefs around health decision making, ability to appraise information, having a regular healthcare provider or reliable support system, and confidence in their health decision making. Notably, while these intrinsic factors do not predict pain severity and disability, they do have a significant relationship with a person's quality of life and suggest they are still important factors to consider with individuals with chronic pain.

Importantly, while there are similarities between the findings of this study and other research studies on the relationship between the functional aspects of health literacy and chronic pain it is difficult to compare our results since most studies have focused on measuring functional health literacy, such as reading health information, numeracy and writing abilities.

This study used a broader concept of health literacy that includes functional skills like reading, writing, but also other domains of health literacy.

Limitations

There were several limitations to this study. The cross-sectional nature of the study was a limitation as without longitudinal data it is not possible to establish a true cause and effect relationship. As a result, it is hard to draw any predictive conclusions about the relationship between health literacy and chronic pain severity, disability, and quality of life. Notably, the cross-sectional nature of the study does not reduce the implications of the findings, however it lends room to consider the possible impact of extraneous variables on the study's findings.

This along with the sample size, limits the generalizability of the obtained results and inferring causality. The sample was a predominantly White, heterosexual, and female sample thus, cultural factors might have impacted the results of the study. Subsequently, more diverse ethnic backgrounds are needed in future studies to reevaluate and validate the obtained findings of this study. The use of self-report measures throughout the study is another area of consideration. Potentially, social desirability bias may have influenced responses to the questionnaires and might have partially confounded the results of the investigation. Additionally, many of the scales within the measures utilize Likert scales, which may have affected participant responses as people may choose middle measures instead of the extreme ends of the measure. Also, data for the study was collected through an online questionnaire system, which increased the likelihood of missing data in some survey responses.

Many of the instruments used were reliable and valid, but the measure of adherence was created solely for this study. Adherence is typically defined as the extent to which patients are able to follow agreed recommendations for prescribed treatments with their healthcare providers.

Many research studies use indirect methods of measurements, like pill count, electronic monitoring devices, and self-report measures. Many of the standardized measures can be grouped into questionnaires that assess, medication-taking behavior, medication-taking behavior and barriers to adherence, only barriers to adherence, beliefs associated with adherence, and barriers and beliefs associated with adherence (Anghel, Farcas, & Oprean, 2019). These categories were not aligned with the focus of this study, which was on pain self-management behaviors not just medication adherence. Nevertheless, a more standardized measure of adherence may have offered more information on the relationship between health literacy and adherence. Future research should consider using a more standardized measure of adherence in assessing pain self-management behaviors.

The use of a Principal Component Analysis (PCA) was helpful in reducing the dimensionality of the health literacy questionnaire but resulted in some limitations regarding the interpretability of findings. This study argued that understanding the different aspects of health literacy that influence chronic pain outcomes and health behaviors would be more effective for targeting interventions, but simplifying the measure to explain relationships may have diluted the number of health literacy areas to discuss. Another limitation is the assumption of orthogonality for the PCA, as the components are by design orthogonal to each other, but there may be better basis vectors that may summarize the data but are not orthogonal. Also, the PCA is sensitive to the choice of variables and the order of observations, so if a different selection or arrangement of data occurred may result in different results.

Conclusion

The findings of this study supported some of the hypotheses and inform on the importance of understanding the aspects of health literacy that are fundamental to chronic pain

treatment outcomes. This study advocates for the importance of using a more informative measure of health literacy when assessing a chronic pain population and needs, as it offers information on health literacy skills, needs, strengths, and weaknesses. The information gathered throughout this study suggests the importance of developing treatment interventions aimed at increasing patient confidence in the level of information they have and abilities in navigating the healthcare system, finding good health information, and understanding that health information, and engaging in decision making about their health. These findings highlight the importance of health literacy in chronic pain and suggests future researchers, healthcare professionals, and public policymakers should consider improving health literacy when aiming to decrease pain related disability, severity, and improve patient quality of life. I am hopeful that this study will motivate further empirical work to understand the effects and role health literacy has in influencing pain self-management behaviors and pain related treatment outcomes.

REFERENCES

Aaby, A., Friis, K., Christensen, B., Rowlands, G., & Maindal, H. T. (2017). Health literacy is associated with health behaviour and self-reported health: A large population-based study in individuals with cardiovascular disease. *European Journal of Preventive Cardiology*, *24*(17), 1880-1888

Adams, K., & Corrigan, J. M. (2003). Priority areas for quality improvement. *In Priority areas for national action: transforming health care quality*. National Academies Press (US).

Agency for Healthcare Research and Quality. (2017). National healthcare quality and disparities report.

Allard, P., Maunsell, E., Labbé, J., & Dorval, M. (2001). Educational interventions to improve cancer pain control: a systematic review. *Journal of Palliative Medicine*, *4*(2), 191-203.

Al Sayah, F., Majumdar, S. R., Williams, B., Robertson, S., & Johnson, J. A. (2013). Health literacy and health outcomes in diabetes: A systematic review. *Journal of General Internal Medicine*, *28*(3), 444–452

Al Sayah, F., Qiu, W., & Johnson, J. A. (2016). Health literacy and health-related quality of life in adults with type 2 diabetes: a longitudinal study. *Quality of Life Research*, *25*(6), 1487-1494.

American Academy of Pain Medicine (2011). AAPM facts and figures on pain. Retrieved from www.painmed.org/patientcenter/facts_on_pain

Andersen, R. M., Rice, T. H., & Kominski, G. F. (2011). Changing the US Health Care System, CafeScribe: Key Issues in Health Services Policy and Management. John Wiley & Sons.

Andersen, J. R., Breivik, K., Engelund, I. E., Iversen, M. M., Kirkeleit, J., Norekvål, T. M., Oterhals, K., & Storesund, A. (2022). Correlated physical and mental health composite scores for the RAND-36 and RAND-12 health surveys: can we keep them simple?. *Health and Quality of Life Outcomes, 20*(1), 89. https://doi.org/10.1186/s12955-022-01992-0

Anghel, L. A., Farcas, A. M., & Oprean, R. N. (2019). An overview of the common methods used to measure treatment adherence. *Medicine and Pharmacy Reports, 92*(2), 117-122.

Asghari, A., & Nicholas, M. K. (2001). Pain self-efficacy beliefs and pain behaviour. A prospective study. *Pain, 94*(1), 85-100.

Bair, M. J., Matthias, M. S., Nyland, K. A., Huffman, M. A., Stubbs, D. L., Kroenke, K., & Damush, T. M. (2009). Barriers and facilitators to chronic pain self-management: a qualitative study of primary care patients with comorbid musculoskeletal pain and depression. *Pain Medicine, 10*(7), 1280-1290.

Baker, D. W., Wolf, M. S., Feinglass, J., Thompson, J. A., Gazmararian, J. A., & Huang, J. (2007). Health literacy and mortality among elderly persons. *Archives of Internal Medicine, 167*(14), 1503-1509.

Baker, T. A., O'Connor, M. L., & Krok, J. L. (2014). Experience and knowledge of pain management in patients receiving outpatient cancer treatment: what do older adults really know about their cancer pain?. *Pain Medicine, 15*(1), 52-60.

Barlow J, Wright C, Sheasby J, Turner A, Hainsworth J. (2002). Self-management approaches for people with chronic conditions: a review. *Patient Educ Couns*, 48:177–187.

Baur, C. (2010). The national action plan to improve health literacy. *US Department of Health and Human Services, Office of Disease Prevention and Health Promotion*.

Beauchamp, A., Buchbinder, R., Dodson, S., Batterham, R. W., Elsworth, G. R., McPhee, C., ... & Osborne, R. H. (2015). Distribution of health literacy strengths and weaknesses across socio-demographic groups: a cross-sectional survey using the Health Literacy Questionnaire (HLQ). *BMC Public Health, 15*(1), 1-13.

Bennett, I. M., Chen, J., Soroui, J. S., & White, S. (2009). The contribution of health literacy to disparities in self-rated health status and preventive health behaviors in older adults. *The Annals of Family Medicine,* 7(3), 204-211.

Berkman, N. D., Sheridan, S. L., Donahue, K. E., Halpern, D. J., & Crotty, K. (2011). Low health literacy and health outcomes: an updated systematic review. *Annals of Internal Medicine*, 155(2), 97-107.

Bo, A., Friis, K., Osborne, R. H., & Maindal, H. T. (2014). National indicators of health literacy: ability to understand health information and to engage actively with healthcare providers-a population-based survey among Danish adults. *BMC Public Health*, *14*(1), 1-12.

Briggs, A. M., Jordan, J. E., Buchbinder, R., Burnett, A. F., O'Sullivan, P. B., Chua, J. Y., ... & Straker, L. M. (2010). Health literacy and beliefs among a community cohort with and without chronic low back pain. *Pain*, 150(2), 275-283.

Briggs, A. M., Jordan, J. E., O'Sullivan, P. B., Buchbinder, R., Burnett, A. F., Osborne, R. H., & Straker, L. M. (2011). Individuals with chronic low back pain have greater difficulty in engaging in positive lifestyle behaviours than those without back pain: an assessment of health literacy. *BMC Musculoskeletal Disorders, 12*(1), 1-10.

Brown, C., Barner, J., Bohman, T., & Richards, K. (2009). A multivariate test of an expanded Andersen Health Care utilization model for complementary and alternative medicine

(CAM) use in African Americans. *The Journal of Alternative and Complementary Medicine, 15*(8), 911-919.

Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate Behavioral Research, 1*, 245-276.

Center for Disease Control (CDC). (2017). *Alzhiemer's Disease and Health Aging: Health disparities*. https://www.cdc.gov/aging/disparities/index.htm

Chinn, D. (2011). Critical health literacy: A review and critical analysis. *Social Science & Medicine*, 73(1), 60-67.

Cleeland, C. S., & Ryan, K. M. (1994). Pain assessment: global use of the Brief Pain Inventory. *Annals, Academy of Medicine, Singapore*.

Clouston, S. A., Manganello, J. A., & Richards, M. (2017). A life course approach to health literacy: the role of gender, educational attainment and lifetime cognitive capability. *Age and Ageing*. *46*(3), 493-499.

Comings, J., Reder, S., & Sum, A. (2001). Building a level playing field. *Cambridge, MA: National Center for the Study of Adult Learning and Literacy*.

Couture, É. M., Chouinard, M. C., Fortin, M., & Hudon, C. (2017). The relationship between health literacy and quality of life among frequent users of health care services: a cross-sectional study. *Health and Quality of Life Outcomes, 15*(1), 1-6.

Crandall, S., Howlett, S., & Keysor, J. J. (2013). Exercise adherence interventions for adults with chronic musculoskeletal pain. *Physical Therapy, 93*(1), 17-21.

Cruz-Almeida, Y., & Fillingim, R. B. (2014). Can quantitative sensory testing move us closer to mechanism-based pain management? *Pain Medicine*, 15(1), 61-72.

Damush, T. M., Weinberger, M., Perkins, S. M., Rao, J. K., Tierney, W. M., Qi, R., & Clark, D. O. (2003). The long-term effects of a self-management program for inner-city primary care patients with acute low back pain. *Archives Of Internal Medicine, 163*(21), 2632-2638.

Davis, T. C., Crouch, M. A., Long, S. W., Jackson, R. H., Bates, P., George, R. B., & Bairnsfather, L. E. (1991). Rapid assessment of literacy levels of adult primary care patients. *Family Medicine,* 23(6), 433-435.

Day, M. A., Thorn, B. E., & Kapoor, S. (2011). A qualitative analysis of a randomized controlled trial comparing a cognitive-behavioral treatment with education. *The Journal of Pain, 12*(9), 941-952.

Debussche, X., Lenclume, V., Balcou-Debussche, M., Alakian, D., Sokolowsky, C., Ballet, D., ... & Huiart, L. (2018). Characterisation of health literacy strengths and weaknesses among people at metabolic and cardiovascular risk: Validity testing of the Health Literacy Questionnaire. *SAGE Open Medicine*, *6*, 2050312118801250.

Demian, M. N., Shapiro, R. J., & Thornton, W. L. (2016). An observational study of health literacy and medication adherence in adult kidney transplant recipients. *NDT Plus*, *9*(6), 858-865.

Dersh, J., Polatin, P. B., & Gatchel, R. J. (2002). Chronic pain and psychopathology: research findings and theoretical considerations. *Psychosomatic Medicine, 64*(5), 773-786.

Devraj, R., Herndon, C. M., & Griffin, J. (2013). Pain awareness and medication knowledge: A health literacy evaluation. *Journal of Pain & Palliative Care Pharmacotherapy, 27*(1), 19-27. doi:10.3109/15360288.2012.751955

Dixon, K. E., Keefe, F. J., Scipio, C. D., Perri, L. M., & Abernethy, A. P. (2007). Psychological interventions for arthritis pain management in adults: a meta-analysis. *Health Psychology, 26*(3), 241.

Dodson, S., Good, S., & Osborne, R. (2015). Health literacy toolkit for low and middle-income countries: a series of information sheets to empower communities and strengthen health systems. *World Health Organization.*

Dubois MY, Follett KA. Pain medicine: the case for an independent medical specialty and training programs. Acad Med J Assoc Am Med Coll. 2014;89(6):863–8.

Dumoulin, C., Cacciari, L. P., & Hay-Smith, E. J. C. (2018). Pelvic floor muscle training versus no treatment, or inactive control treatments, for urinary incontinence in women. *Cochrane Database of Systematic Reviews*, (10).

Eccleston, C., Palermo, T. M., Williams, A. C., Lewandowski, A., & Morley, S. (2009). Psychological therapies for the management of chronic and recurrent pain in children and adolescents. *Cochrane Database of Systematic Reviews, 2009*(2), Article No. CD003968. doi: 10.1002/14651858.CD003968.pub2

Edgerton, J. D., Roberts, L. W., & von Below, S. (2011). Education and quality of life. *Handbook of Social Indicators and Quality of Life Research*, 265-296.

Edward, J., Carreon, L. Y., Williams, M. V., Glassman, S., & Li, J. (2018). The importance and impact of patients' health literacy on low back pain management: a systematic review of literature. *The Spine Journal*, *18*(2), 370-376.

Elsworth, G. R., Beauchamp, A., & Osborne, R. H. (2016). Measuring health literacy in community agencies: a Bayesian study of the factor structure and measurement

invariance of the health literacy questionnaire (HLQ). *BMC Health Services Research*, *16*(1), 1-14.

Epstein, R. M., & Street, R. L. (2011). The values and value of patient-centered care. *Annals of Family Medicine*, *9*(2) 100-103

Ferrari, S., Vanti, C., Pellizzer, M., Dozza, L., Monticone, M., & Pillastrini, P. (2019). Is there a relationship between self-efficacy, disability, pain and sociodemographic characteristics in chronic low back pain? A multicenter retrospective analysis. *Archives of Physiotherapy*, *9*, 1-9.

Fletcher, C., Bradnam, L., & Barr, C. (2016). The relationship between knowledge of pain neurophysiology and fear avoidance in people with chronic pain: A point in time, observational study. *Physiotherapy Theory and Practice*, *32*(4), 271-276.

Friis, K., Lasgaard, M., Osborne, R. H., & Maindal, H. T. (2016). Gaps in understanding health and engagement with healthcare providers across common long-term conditions: a population survey of health literacy in 29 473 Danish citizens. *BMJ Open*, *6*(1), e009627.

Fuentes, M., Hart-Johnson, T., & Green, C. R. (2007). The association among neighborhood socioeconomic status, race and chronic pain in black and white older adults. *Journal of the National Medical Association*, 99(10), 1160.

Fujiwara, A., Ida, M., Watanabe, K., Kawanishi, H., Kimoto, K., Yoshimura, K., ... & Kawaguchi, M. (2021). Prevalence and associated factors of disability in patients with chronic pain: An observational study. *Medicine*, *100*(40).

Furnes, B., Natvig, G. K., & Dysvik, E. (2014). Therapeutic elements in a self-management approach: experiences from group participation among people suffering from chronic

pain. *Patient Preference & Adherence, 8*, 1085–1092. https://doi-org.proxy-remote.galib.uga.edu/10.2147/PPA.S68046

Gatchel, R. J., Peng, Y. B., Peters, M. L., Fuchs, P. N., & Turk, D. C. (2007). The biopsychosocial approach to chronic pain: scientific advances and future directions. *Psychological Bulletin*, *133*(4), 581.

George, D. & Mallery, M. (2010). SPSS for Windows Step by Step: A Simple Guide and Reference, 17.0 update (10a ed.) Boston: Pearson.

Glassman, S. D., Carreon, L. Y., Brown, M. E., Jones, J. S., Edward, J., Li, J., & Williams, M. V. (2019). The impact of health literacy on health status and resource utilization in lumbar degenerative disease. *The Spine Journal*, *19*(4), 711-716.

Grace, S. L., Gravely-Witte, S., Brual, J., Monette, G., Suskin, N., Higginson, L., ... & Stewart, D. E. (2008). Contribution of patient and physician factors to cardiac rehabilitation enrollment: a prospective multilevel study. *European Journal of Preventive Cardiology*, *15*(5), 548-556.

Graham, A., Hasking, P., Brooker, J., Clarke, D., & Meadows, G. (2017). Mental health service use among those with depression: an exploration using Andersen's Behavioral Model of Health Service Use. *Journal of Affective Disorders, 208*, 170-176.

Green, C. R., & Hart-Johnson, T. (2012). The association between race and neighborhood socioeconomic status in younger Black and White adults with chronic pain. *The Journal of Pain*, 13(2), 176-186.

Haack, M., Kramer, S., Seidel, G., & Dierks, M. L. (2020). Quality of life and fear of disease progression are associated with aspects of health literacy in men with prostate cancer from Germany. *Supportive Care in Cancer*, *28*, 2283-2292.

Hadi, M. A., McHugh, G. A., & Closs, S. J. (2019). Impact of chronic pain on patients' quality of life: a comparative mixed-methods study. *Journal of Patient Experience, 6*(2), 133-141.

Hadjistavropoulos, H., & Shymkiw, J. (2007). Predicting readiness to self-manage pain. The *Clinical Journal of Pain, 23*(3), 259-266.

Haefeli, M., & Elfering, A. (2006). Pain assessment. *European Spine Journal, 15*(1), S17-S24.

Halm, E. A., Mora, P., & Leventhal, H. (2006). No symptoms, no asthma: the acute episodic disease belief is associated with poor self-management among inner-city adults with persistent asthma. *Chest, 129*(3), 573-580.

Haverfield, M. C., Giannitrapani, K., Timko, C., & Lorenz, K. (2018). Patient-centered pain management communication from the patient perspective. *Journal of general internal medicine, 33*, 1374-1380.

Hays, R. D., Sherbourne, C. D., & Mazel, R. M. (1993). The rand 36-item health survey 1.0. *Health Economics, 2*(3), 217-227.

Heckman, B. D., Holroyd, K. A., Tietjen, G., O'Donnell, F. J., Himawan, L., Utley, C., ... & Stillman, M. (2009). Whites and African-Americans in headache specialty clinics respond equally well to treatment. *Cephalalgia, 29*(6), 650-661.

Heckman, B. D., Holroyd, K. A., O'Donnell, F. J., Tietjen, G., Utley, C., Stillman, M., & Ellis, G. (2008). Race differences in adherence to headache treatment appointments in persons with headache disorders. *Journal of the National Medical Association, 100*(2), 247-255.

Heijmans, M., Waverijn, G., Rademakers, J., van der Vaart, R., & Rijken, M. (2015). Functional, communicative and critical health literacy of chronic disease patients and their importance for self-management. *Patient Education and Counseling, 98*(1), 41-48.

Henry, S. G., Bell, R. A., Fenton, J. J., & Kravitz, R. L. (2018). Communication about chronic pain and opioids in primary care: impact on patient and physician visit experience. *Pain, 159*(2), 371–379. https://doi.org/10.1097/j.pain.0000000000001098

Hong, Y. R., Samuels, S. K., Huo, J. H., Lee, N., Mansoor, H., & Duncan, R. P. (2019). Patient-centered care factors and access to care: a path analysis using the Andersen behavior model. *Public Health, 171*, 41-49.

Howard, D. H., Sentell, T., & Gazmararian, J. A. (2006). Impact of health literacy on socioeconomic and racial differences in health in an elderly population. *Journal of General Internal Medicine, 21*(8), 857-861. http://dx.doi.org/10.1787/9789264201392-en

Huang, Y. M., Shiyanbola, O. O., & Smith, P. D. (2018). Association of health literacy and medication self-efficacy with medication adherence and diabetes control. *Patient Preference and Adherence, 12*, 793.

Institute of Medicine of the National Academies Report. *Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research, 2011. The National Academies Press*, Washington DC. (page 5) http://books.nap.edu/openbook.php?record_id=13172&page=5

Janevic MR, McLaughlin SJ, Heapy AA, Thacker C, Piette JD. (2017) Racial and Socioeconomic Disparities in Disabling Chronic Pain: Findings From the Health and Retirement Study. *The Journal of Pain, 18*(12):1459–1467

Jensen, M. P., Nielson, W. R., & Kerns, R. D. (2003). Toward the development of a motivational model of pain self-management. *The Journal of Pain, 4*(9), 477-492.

Jessup, R. L., Osborne, R. H., Beauchamp, A., Bourne, A., & Buchbinder, R. (2017). Health literacy of recently hospitalised patients: a cross-sectional survey using the Health Literacy Questionnaire (HLQ). *BMC Health Services Research, 17*(1), 1-12.

Jordan, J. E., Buchbinder, R., Briggs, A. M., Elsworth, G. R., Busija, L., Batterham, R., & Osborne, R. H. (2013). The health literacy management scale (HeLMS): a measure of an individual's capacity to seek, understand and use health information within the healthcare setting. *Patient Education and Counseling, 91*(2), 228-235.

Joynt, M., Train, M. K., Robbins, B. W., Halterman, J. S., Caiola, E., & Fortuna, R. J. (2013). The impact of neighborhood socioeconomic status and race on the prescribing of opioids in emergency departments throughout the United States. *Journal of General Internal Medicine, 28*(12), 1604-1610.

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychology Measureme*nt, *20*, 141-151

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, 39, 32-36.

Kaplan, G. (2005). Biomedicine. *Encyclopedia of Social Measurement*.

Kapoor S., Eyer J., Thorn B. (2016). Health literacy in individuals with chronic pain living in rural United States: Association with pain-related variables. *Journal of Pain, 17*(Suppl. 4), S17–S18.10.1016/j.jpain.2016.01.071

Keller, A. O., Gangnon, R., & Witt, W. P. (2013). Favorable ratings of providers' communication behaviors among US women with depression: a population-based study applying the behavioral model of health services use. *Women's Health Issues, 23*(5), e309-e317.

Kickbusch I., & Maag D. (2008) Health Literacy. *International Encyclopedia of Public Health*. 3 204-211

Kim, H. J. (2014). Influence of educational attainment on pain intensity and disability in patients with lumbar spinal stenosis: mediation effect of pain catastrophizing. *The Spine Journal*, *14*(11), S148-S149.

Kim, H. J., Greenspan, J. D., Ohrbach, R., Fillingim, R. B., Maixner, W., Renn, C. L., ... & Dorsey, S. G. (2019). Racial/ethnic differences in experimental pain sensitivity and associated factors–Cardiovascular responsiveness and psychological status. *PloS ONE*, *14*(4), e0215534.

Kindig, D. A., Panzer, A. M., & Nielsen-Bohlman, L. (Eds.). (2004). *Health Literacy: A Prescription To End Confusion*. National Academies Press.

Klepstad, P., Loge, J. H., Borchgrevink, P. C., Mendoza, T. R., Cleeland, C. S., & Kaasa, S. (2002). The Norwegian brief pain inventory questionnaire: translation and validation in cancer pain patients. *Journal of Pain and Symptom Management*, *24*(5), 517-525.

Koenig, V. E. (2019). Health Literacy: A Universal Call to Action. *Journal of Psychology and Mental Health Care, 10.*

Kolarcik, P., Cepova, E., Geckova, A. M., Elsworth, G. R., Batterham, R. W., & Osborne, R. H. (2017). Structural properties and psychometric improvements of the health literacy questionnaire in a Slovak population. *International Journal of Public Health*, *62*(5), 591-604.

Köppen, P. J., Dorner, T. E., Stein, K. V., Simon, J., & Crevenna, R. (2018). Health literacy, pain intensity and pain perception in patients with chronic pain. *Wiener klinische Wochenschrift*, *130*(1-2), 23-30.

Krein, S. L., Heisler, M., Piette, J. D., Makki, F., & Kerr, E. A. (2005). The effect of chronic pain on diabetes patients' self-management. *Diabetes Care*, *28*(1), 65-70.

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: validity of a brief depression severity measure. *Journal of General Internal Medicine, 16*(9), 606-613.

Lambeek, L. C., van Mechelen, W., Buijs, P. C., Loisel, P., & Anema, J. R. (2009). An integrated care program to prevent work disability due to chronic low back pain: a process evaluation within a randomized controlled trial. *BMC Musculoskeletal Disorders, 10*(1), 1-10.

Logan, R. A. (2017). Seeking an expanded, multidimensional conceptual approach to health literacy and health disparities research. *Information Services & Use*, *37*(1), 59–83. https://doi-org.proxy-remote.galib.uga.edu/10.3233/ISU-160809

Loke, Y. K., Hinz, I., Wang, X., Rowlands, G., Scott, D., & Salter, C. (2012). Impact of health literacy in patients with chronic musculoskeletal disease–systematic review. *PloS ONE, 7*(7), e40210.

Lorig, K. R., & Holman, H. R. (2003). Self-management education: history, definition, outcomes, and mechanisms. *Annals of Behavioral Medicine, 26*(1), 1-7.

Louw, A., Diener, I., Butler, D. S., & Puentedura, E. J. (2011). The effect of neuroscience education on pain, disability, anxiety, and stress in chronic musculoskeletal pain. *Archives of Physical Medicine and Rehabilitation, 92*(12), 2041-2056.

Lowe W., Ballinger C., Protheroe J., Lueddeke J., Nutbeam D., Armstrong R., Adams J. (2013). Effectiveness of musculoskeletal education interventions in people with low literacy levels: A systematic review. *Arthritis Care & Research (Hoboken)*, *65*(12), 1976–1985.10.1002/acr.22085

Macabasco-O'Connell, A., DeWalt, D. A., Broucksou, K. A., Hawk, V., Baker, D. W., Schillinger, D., ... & Pignone, M. (2011). Relationship between literacy, knowledge, self-

care behaviors, and heart failure-related quality of life among patients with heart failure. *Journal of General Internal Medicine, 26*(9), 979-986.

Mackey, L. M., Doody, C., Werner, E. L., & Fullen, B. (2016). Self-management skills in chronic disease management: What role does health literacy have? *Medical Decision Making, 36*(6), 741-759. doi:10.1177/0272989X16638330

McDowell, I. (2006). *Measuring health: a guide to rating scales and questionnaires*. Oxford University Press, USA.

McHorney, C. A., Ware Jr, J. E., Lu, J. R., & Sherbourne, C. D. (1994). The MOS 36-item Short-Form Health Survey (SF-36): III. Tests of data quality, scaling assumptions, and reliability across diverse patient groups. *Medical Care*, 40-66.

Meeus, M., Nijs, J., Van Oosterwijck, J., Van Alsenoy, V., & Truijen, S. (2010). Pain physiology education improves pain beliefs in patients with chronic fatigue syndrome compared with pacing and self-management education: a double-blind randomized controlled trial. *Archives of Physical Medicine and Rehabilitation, 91*(8), 1153-1159.

Mehralian, G., Yusefi, A. R., Davarani, E. R., Ahmadidarrehsima, S., & Nikmanesh, P. (2023). Examining the relationship between health literacy and quality of life: evidence from older people admitted to the hospital. *BMC geriatrics*, *23*(1), 1-9.

Montbleau, K. E., King, D., Henault, L., & Magnani, J. W. (2017). Health literacy, health-related quality of life, and atrial fibrillation. *Cogent Medicine*, *4*(1), 1412121.

Morris, R. L., Soh, S. E., Hill, K. D., Buchbinder, R., Lowthian, J. A., Redfern, J., ... & Barker, A. L. (2017). Measurement properties of the health literacy questionnaire (HLQ) among older adults who present to the emergency department after a fall: a Rasch analysis. *BMC Health Services Research*, *17*(1), 1-11.

Morris, J. R., Harrison, S. L., Robinson, J., Martin, D., & Avery, L. (2023). Non-pharmacological and non-invasive interventions for chronic pain in people with chronic obstructive pulmonary disease: A systematic review without meta-analysis. *Respiratory Medicine*, 107191.

Mossey J. M. (2011). Defining racial and ethnic disparities in pain management. *Clinical Orthopaedics and Related Researc*h, 469(7), 1859–1870. https://doi.org/10.1007/s11999-011-1770-9

Munder, T., Wilmers, F., Leonhart, R., Linster, H. W., & Barth, J. (2010). Working Alliance Inventory-Short Revised (WAI-SR): psychometric properties in outpatients and inpatients. *Clinical Psychology & Psychotherapy: An International Journal of Theory & Practice*, *17*(3), 231-239.

Murphy, J. L., McKellar, J. D., Raffa, S. D., Clark, M. E., Kerns, R. D., & Karlin, B. E. (2014). Cognitive behavioral therapy for chronic pain among veterans: Therapist manual. *Washington, DC: US Department of Veterans Affairs*.

Nahin, R. L. (2015). Estimates of pain prevalence and severity in adults: United States, 2012. *The Journal of Pain*, *16*(8), 769-780.

Newman, S., Steed, E., & Mulligan, K. (2008*). Chronic physical illness: self-management and behavioural interventions: self management and behavioural interventions*. McGraw-Hill Education (UK).

Nielsen-Bohlman, L., Panzer, A. M., & Kindig, D. A. (2004). The extent and associations of limited health literacy. In *Health literacy: a prescription to end confusion*. National Academies Press (US).

Nordeman, L., Nilsson, B., Möller, M., & Gunnarsson, R. (2006). Early access to physical therapy treatment for subacute low back pain in primary health care: a prospective randomized clinical trial. *The Clinical Journal of Pain*, *22*(6), 505-511.

Nutbeam, D. (2000). Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion International*, *15*(3), 259-267.

Nutbeam, D. (2008). The evolving concept of health literacy. *Social Science & Medicine*, 67(12), 2072-2078.

Nutbeam, D., & Lloyd, J. E. (2021). Understanding and responding to health literacy as a social determinant of health. *Annu Rev Public Health*, *42*(1), 159-73.

OECD (2013), How's Life? 2013: Measuring Well-being, OECD Publishing.

Osborne, R. H., Batterham, R. W., Elsworth, G. R., Hawkins, M., & Buchbinder, R. (2013). The grounded psychometric development and initial validation of the Health Literacy Questionnaire (HLQ). *BMC Public Health*, *13*(1), 1–17. https://doi-org.proxy-remote.galib.uga.edu/10.1186/1471-2458-13-658

Paasche-Orlow, M. K., & Wolf, M. S. (2007). The causal pathways linking health literacy to health outcomes. *American Journal of Health Behavior*, *31*(1), S19-S26.

Pagán-Ortiz, M. E., & Cortés, D. E. (2021). Feasibility of an online health intervention for Latinas with chronic pain. *Rehabilitation Psychology*, *66*(1), 10.

Panahi, S., Rathi, N., Hurley, J., Sundrud, J., Lucero, M., & Kamimura, A. (2022). Patient adherence to health care provider recommendations and medication among free clinic patients. *Journal of Patient Experience*, *9*, 23743735221077523.

Parker, R. M., Baker, D. W., Williams, M. V., & Nurss, J. R. (1995). The test of functional health literacy in adults. *Journal of General Internal Medicine, 10*(10), 537-541.

Pergolotti, M., Cutchin, M. P., Weinberger, M., & Meyer, A. M. (2014). Occupational therapy use by older adults with cancer. *American Journal of Occupational Therapy, 68*(5), 597-607.

Perinetti, G. (2019). StaTips part VI: Bivariate correlation. *South European Journal of Orthodontics and Dentofacial Research*, *6*(1), 2-5.

Powers, S. W., & Andrasik, F. (2005). Biobehavioral treatment, disability, and psychological effects of pediatric headache. *Pediatric Annals, 34*(6), 461-465.

Powers, S. W., Gilman, D. K., & Hershey, A. D. (2006). Headache and psychological functioning in children and adolescents. Headache: *The Journal of Head and Face Pain*, *46*(9), 1404-1415.

Protheroe, J., Nutbeam, D., & Rowlands, G. (2009). Health literacy: a necessity for increasing participation in health care. *British Journal of General Practice*, *59*(567), 721-723.

Raghupathi, V., & Raghupathi, W. (2020). The influence of education on health: an empirical assessment of OECD countries for the period 1995–2015. *Archives of Public Health*, *78*(1), 1-18.

Rambla, C., Aragonès, E., Pallejà-Millán, M. et al. Short and long-term predictors of pain severity and interference in primary care patients with chronic musculoskeletal pain and depression. *BMC Musculoskeletal Disorders* 24, 270 (2023). https://doi.org/10.1186/s12891-023-06357-2

Ramsey, R. R., Ryan, J. L., Hershey, A. D., Powers, S. W., Aylward, B. S., & Hommel, K. A. (2014). Treatment adherence in patients with headache: A systematic review. Headache:

The Journal of Head and Face Pain, 54(5), 795–816. https://doi-org.proxyremote.galib.uga.edu/10.1111/head.12353

Rapoff, M. A. (2010). Consequences of nonadherence and correlates of adherence. In *Adherence to pediatric medical regimens* (pp. 33-45). Springer, Boston, MA.

Rios, R., Aiken, L. S., & Zautra, A. J. (2012). Neighborhood contexts and the mediating role of neighborhood social cohesion on health and psychological distress among Hispanic and non-Hispanic residents. *Annals of Behavioral Medicine, 43*(1), 50-61.

Riskowski, J. L. (2014). Associations of socioeconomic position and pain prevalence in the United States: Findings from the National Health and Nutrition Examination Survey. *Pain Medicine, 15*(9), 1508-1521.

Rogers, A. H., Bakhshaie, J., Orr, M. F., Ditre, J. W., & Zvolensky, M. J. (2020). Health literacy, opioid misuse, and pain experience among adults with chronic pain. *Pain Medicine, 21*(4), 670-676.

Rothman, R. L., Montori, V. M., Cherrington, A., & Pignone, M. P. (2008). Perspective: the role of numeracy in health care. *Journal of Health Communication, 13*(6), 583-595.

Rothrock, J. F., Parada, V. A., Sims, C., Key, K., Walters, N. S., & Zweifler, R. M. (2006). The impact of intensive patient education on clinical outcome in a clinic-based migraine population. Headache: *The Journal of Head and Face Pain, 46*(5), 726-731.

Ruben, M. A., Meterko, M., & Bokhour, B. G. (2018). Do patient perceptions of provider communication relate to experiences of physical pain?. *Patient Education and Counseling, 101*(2), 209-213.

Scott, T. L., Gazmararian, J. A., Williams, M. V., & Baker, D. W. (2002). Health literacy and preventive health care use among Medicare enrollees in a managed care organization. *Medical care*, *40*(5), 395-404.

See, Y. K. C., Smith, H. E., Car, L. T., Protheroe, J., Wong, W. C., & Bartlam, B. (2021). Health literacy and health outcomes in patients with low back pain: a scoping review. *BMC Medical Informatics and Decision Making*, *21*(1), 1-19.

Sentell, T. L., & Halpin, H. A. (2006). Importance of adult literacy in understanding health disparities. *Journal of General Internal Medicine*, *21*(8), 862-866.

Setia, M. S. (2016). Methodology series module 3: Cross-sectional studies. *Indian Journal of Dermatology*, *61*(3), 261.

Shaygan, M., Jaberi, A., Firozian, R., & Yazdani, Z. (2022). Comparing the effects of multimedia and face-to-face pain management education on pain intensity and pain catastrophizing among patients with chronic low back pain: A randomized clinical trial. *Plos One*, *17*(6), e0269785.

Shealy, K. M., & Threatt, T. B. (2016). Utilization of the Newest Vital Sign (NVS) in practice in the United States. *Health Communication*, *31*(6), 679-687.

Sheikh, A., Donaldson, L., Dhingra-Kumar, N., Bates, D., Kelley, E., & Larizgoitia, I. (2016). Patient engagement: technical series on safer primary care. *Geneva: World Health Organization*, 2016.

Sokol, M. C., McGuigan, K. A., Verbrugge, R. R., & Epstein, R. S. (2005). Impact of medication adherence on hospitalization risk and healthcare cost. *Medical Care*, 521-530.

Song, L., Mishel, M., Bensen, J. T., Chen, R. C., Knafl, G. J., Blackard, B., ... & Godley, P. A. (2012). How does health literacy affect quality of life among men with newly diagnosed

clinically localized prostate cancer? Findings from the North Carolina-Louisiana Prostate Cancer Project (PCaP). *Cancer, 118*(15), 3842-3851.

Speros, C. (2005). Health literacy: concept analysis. *Journal of Advanced Nursing*, 50(6), 633-640.

Stellefson, M., Paige, S. R., Alber, J. M., Chaney, B. H., Chaney, D., Apperson, A., & Mohan, A. (2019). Association between health literacy, electronic health literacy, disease-specific knowledge, and health-related quality of life among adults with chronic obstructive pulmonary disease: cross-sectional study. *Journal of Medical Internet Research, 21*(6), e12165.

Street Jr, R. L. (2013). How clinician–patient communication contributes to health improvement: modeling pathways from talk to outcome. *Patient Education and Counseling*, *92*(3), 286-291.

Stubbs, D., Krebs, E., Bair, M., Damush, T., Wu, J., Sutherland, J., & Kroenke, K. (2010). Sex differences in pain and pain-related disability among primary care patients with chronic musculoskeletal pain. *Pain Medicine*, *11*(2), 232-239.

Sullivan, M., Langford, D. J., Davies, P. S., Tran, C., Vilardaga, R., Cheung, G., ... & Vowles, K. E. (2018). A controlled pilot trial of PainTracker Self-Manager, a web-based platform combined with patient coaching, to support patients' self-management of chronic pain. *The Journal of Pain*, *19*(9), 996-1005.

Świeboda, P., Filip, R., Prystupa, A., & Drozd, M. (2013). Assessment of pain: types, mechanism and treatment. *Pain*, *2*(7).

Tait, R. C., & Chibnall, J. T. (2014). Racial/ethnic disparities in the assessment and treatment of pain: psychosocial perspectives. American Psychologist, 69(2), 131.

Tait, R. C., Chibnall, J. T., & Krause, S. (1990). The pain disability index: psychometric properties. *Pain, 40*(2), 171-182.

Taft C, Karlsson J, & Sullivan M. (2001) Do SF-36 summary component scores accurately summarize subscale scores? Qual Life Res. *10*(5):395-404

Thompson, E. L., Broadbent, J., Bertino, M. D., & Staiger, P. K. (2016). Do pain-related beliefs influence adherence to multidisciplinary rehabilitation?: a systematic review. *The Clinical Journal of Pain, 32*(2), 164-178.

Thorn, B. E., Day, M. A., Burns, J., Kuhajda, M. C., Gaskins, S. W., Sweeney, K., … Cabbil, C. (2011). Randomized trial of group cognitive behavioral therapy compared with a pain education control for low-literacy rural people with chronic pain. *Pain, 152*(12), 2710–2720. https://doi-org.proxy-remote.galib.uga.edu/10.1016/j.pain.2011.07.007

Thorn, B. E., Eyer, J. C., Van Dyke, B. P., Torres, C. A., Burns, J. W., Kim, M., ... & Bobrow, B. J. (2018). Literacy-adapted cognitive behavioral therapy versus education for chronic pain at low-income clinics: a randomized controlled trial. *Annals of Internal Medicine*, *168*(7), 471-480.

Timmerman, L., Stronks, D. L., Groeneweg, J. G., & Huygen, F. J. (2016). Prevalence and determinants of medication non-adherence in chronic pain patients: a systematic review. *Acta Anaesthesiologica Scandinavica, 60*(4), 416-431.

Tokuda, Y., Doba, N., Butler, J. P., & Paasche-Orlow, M. K. (2009). Health literacy and physical and psychological wellbeing in Japanese adults. *Patient Education and Counseling, 75*(3), 411-417.

Treede, R. D., Rief, W., Barke, A., Aziz, Q., Bennett, M. I., Benoliel, R., ... & Wang, S. J. (2015). A classification of chronic pain for ICD-11. *Pain*, *156*(6), 1003.

Turk, D. C. (2002). A cognitive-behavioral perspective on treatment of chronic pain patients. In D. C. Turk & R. J. Gatchel (Eds.), *Psychological Approaches to Pain Management: A Practitioner's Handbook., 2nd ed.* (pp. 138–158). New York, NY: Guilford Press. Retrieved from http://proxy-remote.galib.uga.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2003-04573-007&site=ehost-live

Turk, D. C., & Meichenbaum, D. (1991). Adherence to self-care regimens. In *Handbook of clinical psychology in medical settings* (pp. 249-266). Springer, Boston, MA.

Turk, D. C., & Okifuji, A. (2002). Psychological factors in chronic pain: evolution and revolution. Journal of Consulting and Clinical Psychology, 70(3), 678.

Turk, D., Fillingim, R., Ohrbach, R., & Patel, K., (2016) "Assessment of psychosocial and functional impact of chronic pain." *The Journal of Pain* 17, no. 9): T21-T49.

Ulirsch, J. C., Weaver, M. A., Bortsov, A. V., Soward, A. C., Swor, R. A., Peak, D. A., ... & McLean, S. A. (2014). No man is an island: living in a disadvantaged neighborhood influences chronic pain development after motor vehicle collision. *PAIN*, *155*(10), 2116-2123.

US Department of Health and Human Services. (2019). 2018 National Healthcare Quality and Disparities Report.

Van Dyke, B., Kim, M., & Thorn, B. (2018). Longitudinal relationships between perceived social support and quality-of-life among patients with chronic pain. *The Journal of Pain*, *19*(3), S39.

van Erp, R. M., Huijnen, I. P., Jakobs, M. L., Kleijnen, J., & Smeets, R. J. (2019). Effectiveness of primary care interventions using a biopsychosocial approach in chronic low back pain: a systematic review. Pain Practice, 19(2), 224-241.

Van Hecke, A., Van Lancker, A., De Clercq, B., De Meyere, C., Dequeker, S., & Devulder, J. (2016). Pain intensity in hospitalized adults: a multilevel analysis of barriers and facilitators of pain management. *Nursing Research, 65*(4), 290-300.

Van Oosterwijck, J., Meeus, M., Paul, L., De Schryver, M., Pascal, A., Lambrecht, L., & Nijs, J. (2013). Pain physiology education improves health status and endogenous pain inhibition in fibromyalgia: a double-blind randomized controlled trial. *The Clinical Journal of Pain, 29*(10), 873-882.

Van Oosterwijck, J., Nijs, J., Meeus, M., Truijen, S., Craps, J., Van den Keybus, N., & Paul, L. (2011). Pain neurophysiology education improves cognitions, pain thresholds and movement performance in people with chronic whiplash: a pilot study. *Journal Of Rehabilitation Research and Development, 48*(1), 43-58.

Vernon, J. A., Trujillo, A., Rosenbaum, S. J., & DeBuono, B. (2007). Low health literacy: Implications for national health policy.

Vos T, Allen C, Arora M, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990e2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet 2017; 390: 1211e59

Wang, C., Kane, R. L., Xu, D., & Meng, Q. (2015). Health literacy as a moderator of health-related quality of life responses to chronic disease among Chinese rural women. *BMC Women's Health, 15*(1), 34.

Washington, D. M., Curtis, L. M., Waite, K., Wolf, M. S., & Paasche-Orlow, M. K. (2018). Sociodemographic factors mediate race and ethnicity-associated childhood asthma health disparities: a longitudinal analysis. *Journal Of Racial and Ethnic Health Disparities, 5*(5), 928-938.

Waters, T., Collins, J., Galinsky, T., & Caruso, C. (2006). NIOSH research efforts to prevent musculoskeletal disorders in the healthcare industry. *Orthopaedic Nursing, 25*(6), 380-389.

Welp, A., Woodbury, R. B., McCoy, M. A., & Teutsch, S. M. (2016). National Academies of Sciences, Engineering, and Medicine, Health and Medicine Division, Board on Population Health and Public Health Practice, Committee on Public Health Approaches to Reduce Vision Impairment and Promote Eye Health. Making Eye Health a Population Health Imperative: Vision for Tomorrow.

Williams, A., & Amris, K. (2017). Treatment of persistent pain from torture: review and commentary. *Medicine, Conflict and Survival,* 33(1), 60-81.

Wilson, I. B., & Cleary, P. D. (1995). Linking clinical variables with health-related quality of life: a conceptual model of patient outcomes. *Jama, 273*(1), 59-65.

Woby, S. R., Roach, N. K., Urmston, M., & Watson, P. J. (2007). The relation between cognitive factors and levels of pain and disability in chronic low back pain patients presenting for physiotherapy. *European Journal of Pain, 11*(8), 869-877.

World Health Organization. (2016). Framework on integrated, people-centered health services. Report by the Secretariat. *69th World Health Assembly provisional agenda item, 16*(69).

Yazdi-Ravandi, S., Taslimi, Z., Jamshidian, N., Saberi, H., Shams, J., & Haghparast, A. (2013). Prediction of quality of life by self-efficacy, pain intensity and pain duration in patient with pain disorders. *Basic and clinical neuroscience*, *4*(2), 117.

Yin, H. S., Johnson, M., Mendelsohn, A. L., Abrams, M. A., Sanders, L. M., & Dreyer, B. P. (2009). The health literacy of parents in the United States: a nationally representative study. *Pediatrics*, *124*(Supplement 3), S289-S298.

Zahra, N. A., Elmoaty Sheha, E. A. A., & Elsayed, H. A. (2020). Low back pain, disability and quality of life among health care workers. *Int. J. Pharm. Res. Allied Sci*, *9*(2), 34-44.

Zajacova, A., Rogers, R. G., Grodsky, E., & Grol-Prokopczyk, H. (2020). The relationship between education and pain among adults aged 30–49 in the United States. *The Journal of Pain*, *21*(11-12), 1270-1280.

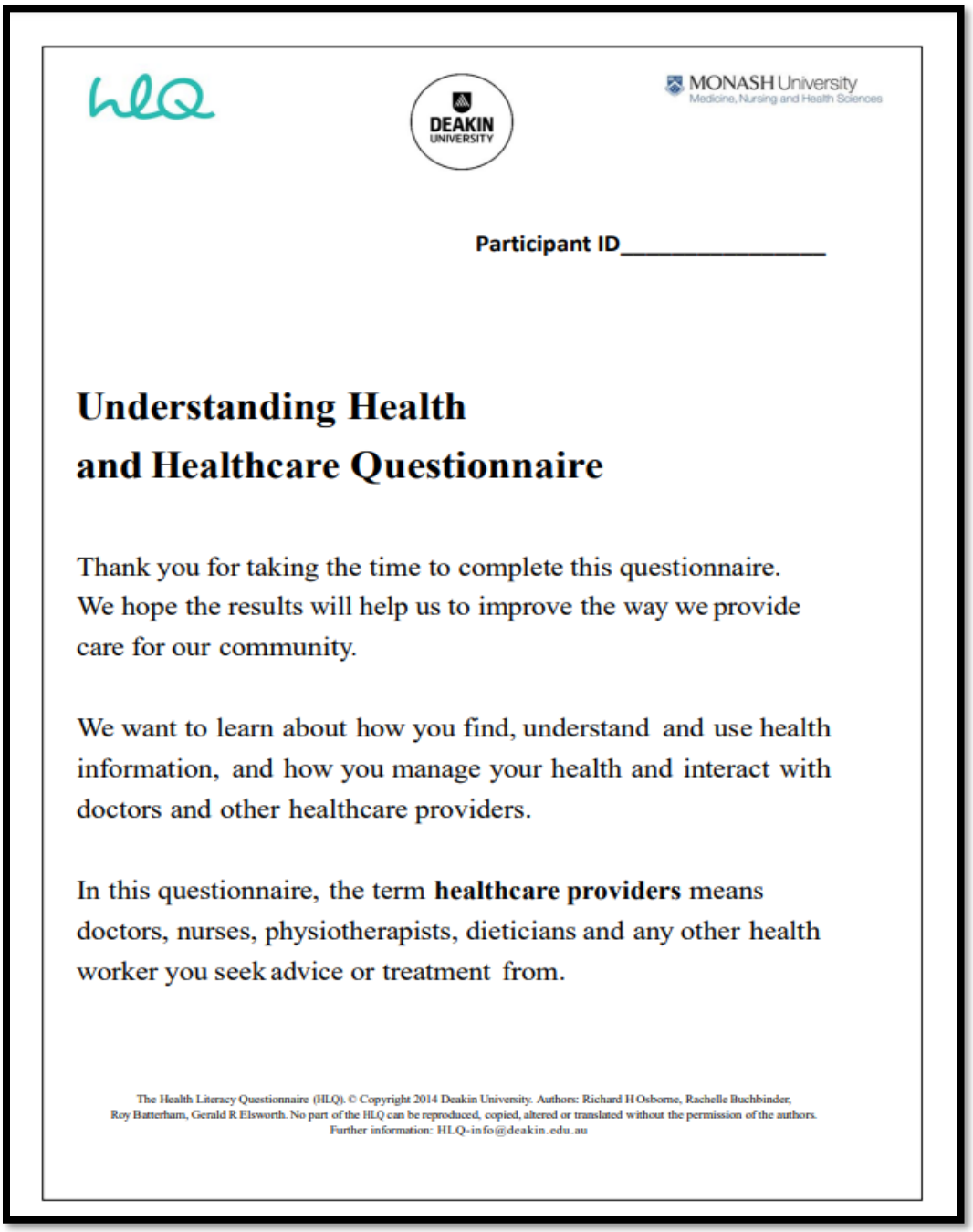
Zelaya, C. E., Dahlhamer, J. M., Lucas, J. W., & Connor, E. M. (2020). *Chronic pain and high-impact chronic pain among US adults, 2019*. NCHS Data Brief, Vol. 390. Hyattsville, MD: National Center for Health Statistics, 2020

Zhang, Y., Prado, M., Geyer, R., Mollis, B., Zbikowski, S., Waters, D., ... & Stephens, K. (2023). Provider challenges and strategies with treating chronic pain: Informing development of digital therapeutics for primary care. *Annals of Family Medicine, 21*, pp. 1–2.

Zheng, M., Jin, H., Shi, N., Duan, C., Wang, D., Yu, X., & Li, X. (2018). The relationship between health literacy and quality of life: a systematic review and meta-analysis. *Health and Quality of Life Outcomes*, *16*(1), 1-10.

APPENDIX A

HEALTH LITERACY QUESTIONNAIRE (HLQ)



hlq

DEAKIN UNIVERSITY

MONASH University
Medicine, Nursing and Health Sciences

Participant ID_____

Understanding Health and Healthcare Questionnaire

Thank you for taking the time to complete this questionnaire. We hope the results will help us to improve the way we provide care for our community.

We want to learn about how you find, understand and use health information, and how you manage your health and interact with doctors and other healthcare providers.

In this questionnaire, the term **healthcare providers** means doctors, nurses, physiotherapists, dieticians and any other health worker you seek advice or treatment from.

The Health Literacy Questionnaire (HLQ). © Copyright 2014 Deakin University. Authors: Richard H Osborne, Rachelle Buchbinder, Roy Batterham, Gerald R Elsworth. No part of the HLQ can be reproduced, copied, altered or translated without the permission of the authors. Further information: HLQ-info@deakin.edu.au

Information about this questionnaire and how to fill it in

This questionnaire contains two parts.

In **Part 1** you are asked to indicate how strongly you **disagree** or **agree** with a set of statements.

In **Part 2** you are asked to indicate how **difficult** or **easy** you find a set of tasks.

For each statement or task check the box that **best describes you now.**

Please ensure that you **check a box** for **every** statement or task.

An example

	Strongly disagree	Disagree	Agree	Strongly agree
1. The Earth is flat	☒	☐	☐	☐

Ms Jane Citizen has indicated that she **strongly disagrees** with this statement.

Part 1 of the questionnaire starts here

Please indicate how strongly you **disagree** or **agree** with each of the following statements.

Remember to check only **one** box for each statement.

Check a box by crossing it like this: ☒

		Strongly disagree	Disagree	Agree	Strongly agree
1	I feel I have good information about health	☐	☐	☐	☐
2	I have at least one healthcare provider who knows me well	☐	☐	☐	☐
3	I can get access to several people who understand and support me	☐	☐	☐	☐
4	I compare health information from different sources	☐	☐	☐	☐
5	When I feel ill, the people around me really understand what I am going through	☐	☐	☐	☐
6	I spend quite a lot of time actively managing my health	☐	☐	☐	☐
7	When I see new information about health, I check up on whether it is true or not	☐	☐	☐	☐

The Health Literacy Questionnaire (HLQ). © Copyright 2014 Deakin University. Authors: Richard H Osborne, Rachelle Buchbinder, Roy Batterham, Gerald R Elsworth. No part of the HLQ can be reproduced, copied, altered or translated without the permission of the authors. Further information: HLQ-info@deakin.edu.au

Part 1 continued
Please indicate how strongly you **disagree** or **agree** with each of the following statements. Remember to check only **one** box for each statement.

		Strongly disagree	Disagree	Agree	Strongly agree
8	I have at least one healthcare provider I can discuss my health problems with	☐	☐	☐	☐
9	I make plans for what I need to do to be healthy	☐	☐	☐	☐
10	I have enough information to help me deal with my health problems	☐	☐	☐	☐
11	If I need help, I have plenty of people I can rely on	☐	☐	☐	☐
12	I always compare health information from different sources and decide what is best for me	☐	☐	☐	☐
13	Despite other things in my life, I make time to be healthy	☐	☐	☐	☐
14	I am sure I have all the information I need to manage my health effectively	☐	☐	☐	☐
15	I have at least one person who can come to medical appointments with me	☐	☐	☐	☐
16	I know how to find out if the health information I receive is right or not	☐	☐	☐	☐
17	I have the healthcare providers I need to help me work out what I need to do	☐	☐	☐	☐
18	I set my own goals about health and fitness	☐	☐	☐	☐
19	I have strong support from family or friends	☐	☐	☐	☐
20	I ask healthcare providers about the quality of the health information I find	☐	☐	☐	☐
21	There are things that I do regularly to make myself more healthy	☐	☐	☐	☐
22	I can rely on at least one healthcare provider	☐	☐	☐	☐
23	I have all the information I need to look after my health	☐	☐	☐	☐

Please continue to the next page.

The Health Literacy Questionnaire (HLQ). © Copyright 2014 Deakin University. Authors: Richard H Osborne, Rachelle Buchbinder, Roy Batterham, Gerald R Elsworth. No part of the HLQ can be reproduced, copied, altered or translated without the permission of the authors. Further information: HLQ-info@deakin.edu.au

Part 2 of the questionnaire starts here
Please indicate how **difficult** or **easy** the following tasks are for you **now.** Remember to check only **one** box for each statement.

Check a box by crossing it like this: ☒

		Cannot do or always difficult	*Usually difficult*	*Sometimes difficult*	*Usually easy*	*Always easy*
1	Find the right health care	☐	☐	☐	☐	☐
2	Make sure that healthcare providers understand your problems properly	☐	☐	☐	☐	☐
3	Find information about health problems	☐	☐	☐	☐	☐
4	Feel able to discuss your health concerns with a healthcare provider	☐	☐	☐	☐	☐
5	Confidently fill medical forms in the correct way	☐	☐	☐	☐	☐
6	Find health information from several different places	☐	☐	☐	☐	☐
7	Have good discussions about your health with doctors	☐	☐	☐	☐	☐
8	Get to see the healthcare providers you need to	☐	☐	☐	☐	☐
9	Accurately follow instructions from healthcare providers	☐	☐	☐	☐	☐
10	Get information about health so you are up to date with the best information	☐	☐	☐	☐	☐
11	Decide which healthcare provider you need to see	☐	☐	☐	☐	☐
12	Read and understand written health information	☐	☐	☐	☐	☐
13	Make sure you find the right place to get the health care you need	☐	☐	☐	☐	☐

Please continue to the next page.

The Health Literacy Questionnaire (HLQ). © Copyright 2014 Deakin University. Authors: Richard H Osborne, Rachelle Buchbinder, Roy Batterham, Gerald R Elsworth. No part of the HLQ can be reproduced, copied, altered or translated without the permission of the authors.

Part 2 continued
Please indicate how **difficult** or **easy** the following tasks are for you now. Remember to check only **one** box for each statement.

		Cannot do or always difficult	Usually difficult	Sometimes difficult	Usually easy	Always easy
14	Get health information in words you understand	☐	☐	☐	☐	☐
15	Discuss things with healthcare providers until you understand all you need to	☐	☐	☐	☐	☐
16	Find out which healthcare services you are entitled to	☐	☐	☐	☐	☐
17	Read and understand all the information on medication labels	☐	☐	☐	☐	☐
18	Get health information by yourself	☐	☐	☐	☐	☐
19	Work out what the best care is for you	☐	☐	☐	☐	☐
20	Ask healthcare providers questions to get the health information you need	☐	☐	☐	☐	☐
21	Understand what healthcare providers are asking you to do	☐	☐	☐	☐	☐

Thank you for completing this questionnaire.

The Health Literacy Questionnaire (HLQ). © Copyright 2014 Deakin University. Authors: Richard H Osborne, Rachelle Buchbinder, Roy Batterham, Gerald R Elsworth. No part of the HLQ can be reproduced, copied, altered or translated without the permission of the authors.
Further information: HLQ-info@deakin.edu.au

APPENDIX B

BRIEF PAIN INVENTORY

1903

Date: (month) / (day) / (year)

Subject's Initials : _____

Study Subject #:

Study Name: _____

Protocol #: _____

PI: _____

Revision: 07/01/05

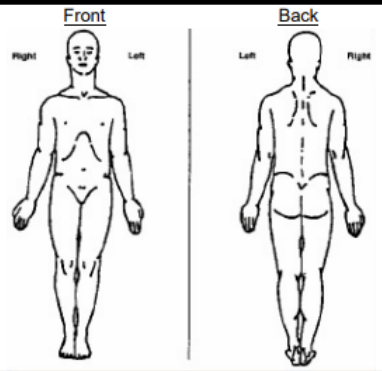
PLEASE USE BLACK INK PEN

Brief Pain Inventory (Short Form)

1. Throughout our lives, most of us have had pain from time to time (such as minor headaches, sprains, and toothaches). Have you had pain other than these everyday kinds of pain today?

☐ Yes ☐ No

2. On the diagram, shade in the areas where you feel pain. Put an X on the area that hurts the most.



3. Please rate your pain by marking the box beside the number that best describes your pain at its **worst** in the last 24 hours.

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

No Pain — Pain As Bad As You Can Imagine

4. Please rate your pain by marking the box beside the number that best describes your pain at its **least** in the last 24 hours.

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

No Pain — Pain As Bad As You Can Imagine

5. Please rate your pain by marking the box beside the number that best describes your pain on the **average.**

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

No Pain — Pain As Bad As You Can Imagine

6. Please rate your pain by marking the box beside the number that tells how much pain you have **right now.**

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

No Pain — Pain As Bad As You Can Imagine

Page 1 of 2

Copyright 1991 Charles S. Cleeland, PhD
Pain Research Group
All rights reserved

1903

Date: (month) / (day) / (year)

Subject's Initials : _____

Study Subject #:

PLEASE USE BLACK INK PEN

Study Name: _____

Protocol #: _____

PI: _____

Revision: 07/01/05

7. What treatments or medications are you receiving for your pain?

8. In the last 24 hours, how much relief have pain treatments or medications provided? Please mark the box below the percentage that most shows how much relief you have received.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
☐ No Relief	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐ Complete Relief

9. Mark the box beside the number that describes how, during the past 24 hours, pain has interfered with your:

A. General Activity

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

Does Not Interfere — Completely Interferes

B. Mood

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

Does Not Interfere — Completely Interferes

C. Walking ability

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

Does Not Interfere — Completely Interferes

D. Normal Work (includes both work outside the home and housework)

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

Does Not Interfere — Completely Interferes

E. Relations with other people

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

Does Not Interfere — Completely Interferes

F. Sleep

☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

Does Not Interfere — Completely Interferes

G. Enjoyment of life

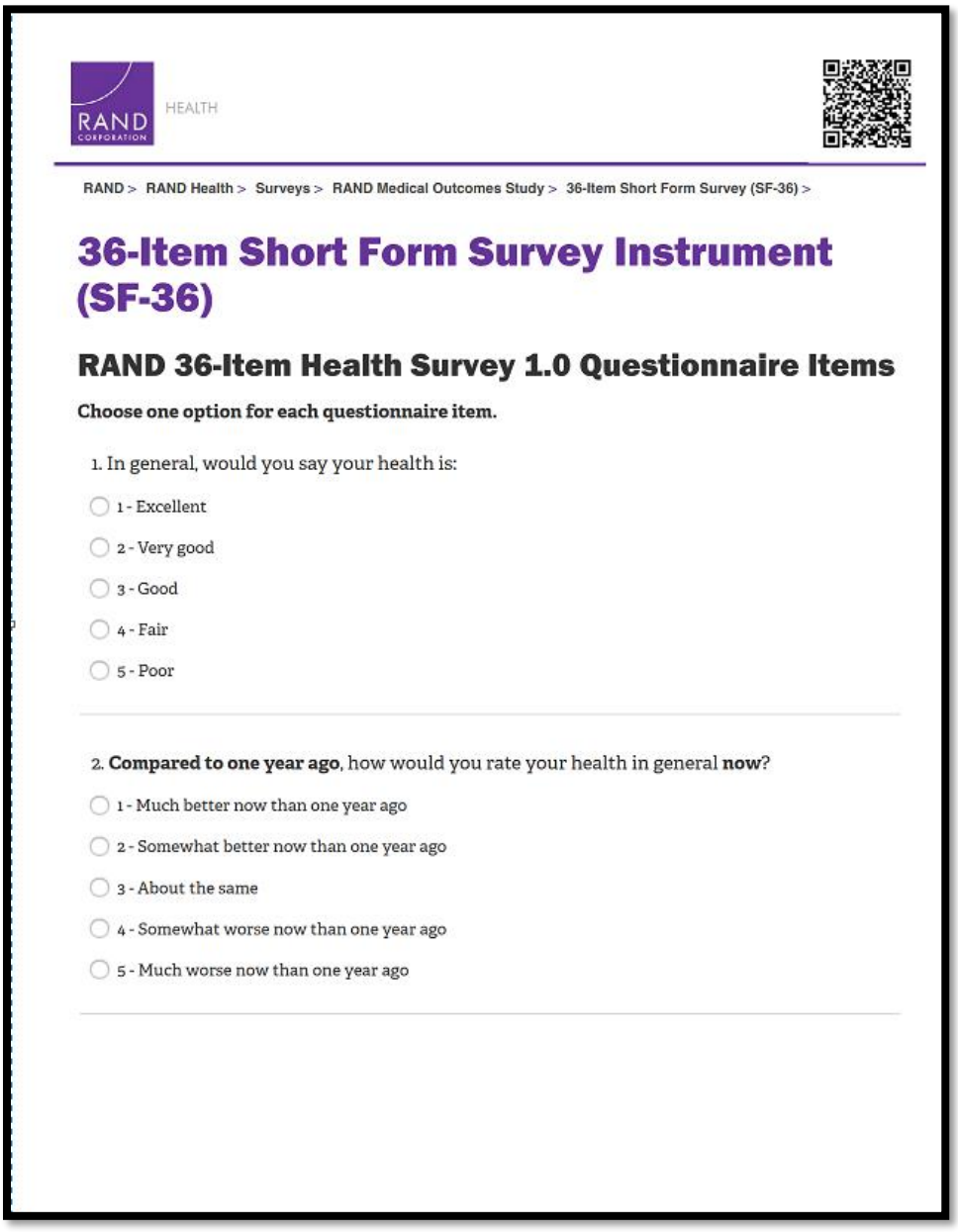
☐0 ☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7 ☐8 ☐9 ☐10

Does Not Interfere — Completely Interferes

Copyright 1991 Charles S. Cleeland, PhD
Pain Research Group
All rights reserved

APPENDIX C

RAND SF-36



RAND HEALTH

RAND > RAND Health > Surveys > RAND Medical Outcomes Study > 36-Item Short Form Survey (SF-36) >

36-Item Short Form Survey Instrument (SF-36)

RAND 36-Item Health Survey 1.0 Questionnaire Items

Choose one option for each questionnaire item.

1. In general, would you say your health is:

- 1 - Excellent
- 2 - Very good
- 3 - Good
- 4 - Fair
- 5 - Poor

2. **Compared to one year ago**, how would you rate your health in general **now**?

- 1 - Much better now than one year ago
- 2 - Somewhat better now than one year ago
- 3 - About the same
- 4 - Somewhat worse now than one year ago
- 5 - Much worse now than one year ago

The following items are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
3. **Vigorous activities**, such as running, lifting heavy objects, participating in strenuous sports	○ 1	○ 2	○ 3
4. **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	○ 1	○ 2	○ 3
5. Lifting or carrying groceries	○ 1	○ 2	○ 3
6. Climbing **several** flights of stairs	○ 1	○ 2	○ 3
7. Climbing **one** flight of stairs	○ 1	○ 2	○ 3
8. Bending, kneeling, or stooping	○ 1	○ 2	○ 3
9. Walking **more than a mile**	○ 1	○ 2	○ 3
10. Walking **several blocks**	○ 1	○ 2	○ 3
11. Walking **one block**	○ 1	○ 2	○ 3
12. Bathing or dressing yourself	○ 1	○ 2	○ 3

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?

	Yes	No
13. Cut down the **amount of time** you spent on work or other activities	○ 1	○ 2
14. **Accomplished less** than you would like	○ 1	○ 2
15. Were limited in the **kind** of work or other activities	○ 1	○ 2
16. Had **difficulty** performing the work or other activities (for example, it took extra effort)	○ 1	○ 2

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?

	Yes	No
17. Cut down the **amount of time** you spent on work or other activities	○ 1	○ 2
18. **Accomplished less** than you would like	○ 1	○ 2
19. Didn't do work or other activities as **carefully** as usual	○ 1	○ 2

20. During the **past 4 weeks**, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

- ○ 1 - Not at all
- ○ 2 - Slightly
- ○ 3 - Moderately
- ○ 4 - Quite a bit
- ○ 5 - Extremely

21. How much **bodily** pain have you had during the **past 4 weeks**?

- 1 - None
- 2 - Very mild
- 3 - Mild
- 4 - Moderate
- 5 - Severe
- 6 - Very severe

22. During the **past 4 weeks**, how much did **pain** interfere with your normal work (including both work outside the home and housework)?

- 1 - Not at all
- 2 - A little bit
- 3 - Moderately
- 4 - Quite a bit
- 5 - Extremely

These questions are about how you feel and how things have been with you **during the past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time during the **past 4 weeks**...

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
23. Did you feel full of pep?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
24. Have you been a very nervous person?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
25. Have you felt so down in the dumps that nothing could cheer you up?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
26. Have you felt calm and peaceful?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
27. Did you have a lot of energy?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
28. Have you felt downhearted and blue?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
29. Did you feel worn out?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
30. Have you been a happy person?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
31. Did you feel tired?	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6

32. During the **past 4 weeks**, how much of the time has **your physical health or emotional problems** interfered with your social activities (like visiting with friends, relatives, etc.)?

- ○ 1 - All of the time
- ○ 2 - Most of the time
- ○ 3 - Some of the time
- ○ 4 - A little of the time
- ○ 5 - None of the time

How TRUE or FALSE is **each** of the following statements for you.

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
33. I seem to get sick a little easier than other people	○ 1	○ 2	○ 3	○ 4	○ 5
34. I am as healthy as anybody I know	○ 1	○ 2	○ 3	○ 4	○ 5
35. I expect my health to get worse	○ 1	○ 2	○ 3	○ 4	○ 5
36. My health is excellent	○ 1	○ 2	○ 3	○ 4	○ 5

ABOUT

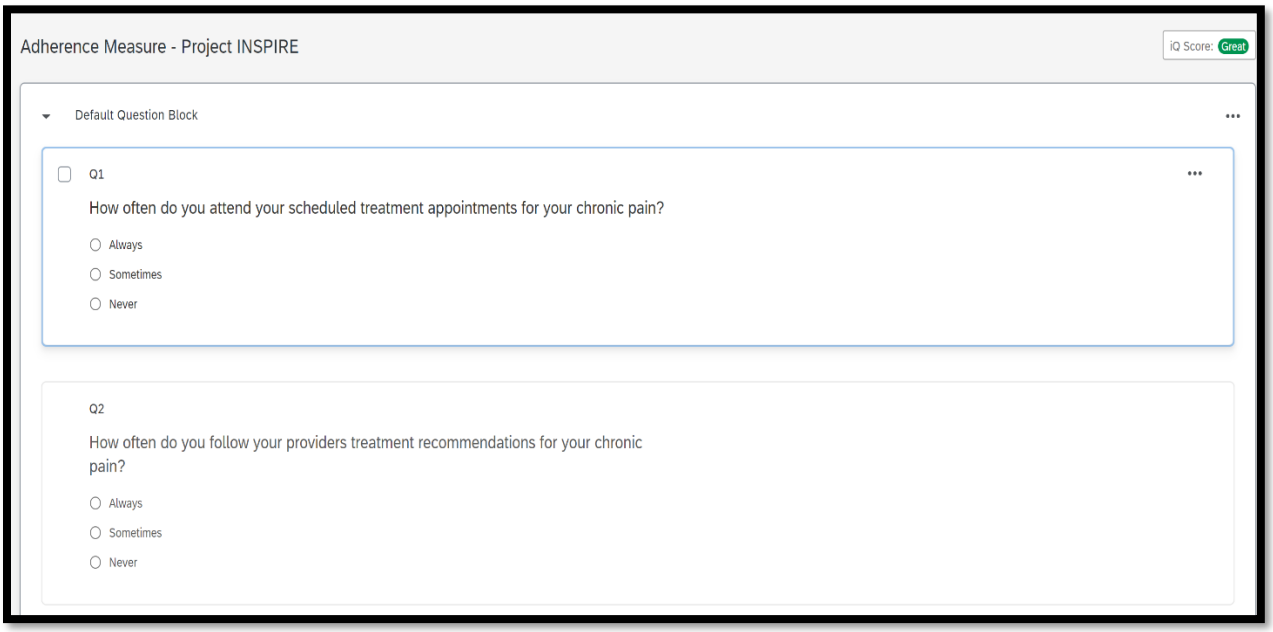
The RAND Corporation is a research organization that develops solutions to public policy challenges to help make communities throughout the world safer and more secure, healthier and more prosperous. RAND is nonprofit, nonpartisan, and committed to the public interest.

1776 Main Street
Santa Monica, California 90401-3208

RAND® is a registered trademark. Copyright © 1994-2016 RAND Corporation.

APPENDIX D

ADHERENCE MEASURE



APPENDIX E

Summary of Intercorrelations for Scores on the Health Literacy Questionnaire, Brief Pain Inventory, RAND-36, and Adherence

	HPS	HSI	AMH	SS	CA	AE	NHS	FHI	UHI
SEV	-.29**	-.30**	-.21	-.22	-.32*	-.35**	-.26*	-.51**	-.50**
INT	-.24	-.38**	-.19	-.24	-.23	-.37**	-.38**	-.26*	-.44**
PCS	.15	.43**	.30*	.27*	.35*	.24	.28*	.32*	.41**
PCSLOG	.19	.43**	.20	.26	.34*	.38**	.39**	.41**	.51**
MCS	.31*	.47**	.45**	.30*	.43**	.44**	.49**	.39**	.42**
ADH1LOG	-.11	.07	.10	-.07	.17	.03	.09	.19	.21
ADH2LOG	-.09	.12	.09	.17	.18	-.13	.05	.09	.12

Note. **Correlation is significant at the .01 level (2-tailed); * Correlation is significant at the .05 level (2-tailed) (TOT = Health literacy index score; SEV = BPI Severity; INT = BPI Interference; ADH1LOG = Adherence to recommendations; ADH2LOG = Adherence to treatment appointments)