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Admission Timing, Age, Sex, Pain, and Disability as Outcome Predictors of Short-Term Pain Programs

Nanesha Courtney
Walden University

Walden University

College of Allied Health

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Nanesha Courtney

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Review Committee
Dr. Lisa Scharff, Committee Chairperson, Psychology Faculty
Dr. Benita Stiles-Smith, Committee Member, Psychology Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

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Abstract

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MS, Walden University, 2017

MA, Argosy University, 2011

BA, Central Washington University, 1996

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Clinical Psychology

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Abstract

Researchers have found that age, sex, education level, and pretreatment pain levels may be significant predictors of patient outcomes; however, it remained unknown whether the timing of treatment predicts pain and disability after a multidisciplinary short-term intensive pain treatment program. The purpose of this quantitative nonexperimental study was to use archival data to examine whether the timing of entry into a multidisciplinary short-term intensive pain treatment program predicted pain and functioning levels at posttreatment. Glasser's choice theory was used to examine whether the combined effect of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance predicted treatment outcome, as measured by change in pain and disability level using multivariate linear regression modeling. The combined effect of age, sex, education level, and time of entrance controlling for preprogram pain and disability levels was statistically significant in accounting for variance in posttreatment program pain and disability levels. Program occupational disability level was a significant predictor of posttreatment program occupational disability levels. Education levels of general equivalency diploma, high school diploma, and bachelor's degree, as well as pretreatment pain level, were significant predictors of posttreatment pain level. Those with at least a bachelor's degree had the greatest decrease in posttreatment pain levels. Health care managers may use these findings for positive social change by developing policies and creating awareness, especially among less educated patients, on the importance of pain management while providing appropriate treatment to patients.

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Dedication

This is dedicated to my loving husband, Scott, and our children, Tom and Camden. Your support, understanding, and encouragement gave me the motivation to continue this path even when I wanted to give up. To my parents, Herb and Wanda, and my brother, Michael, and all those others who continued to push me by asking questions about how much longer it was going to take me to finish this. Your unwavering support helped me navigate the obstacles I faced.

This accomplishment is ours to share. I love you all very much.

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Chapter 1: Introduction to the Study

Chronic pain is a phenomenon that can lead to chronic distress and disability (Patsavas, 2014). Chronic pain is defined as pain lasting longer than 3 to 6 months and negatively affecting the individual's well-being or pain that continues when it should not (American Chronic Pain Association [ACPA], 2021). Chronic pain can severely impact the lives of those suffering psychologically, physiologically, financially, and socially. Individuals with chronic pain often exhibit decreased function and reduced tolerance for physical work, and their quality of life can be lowered (Svanberg et al., 2017).

Chronic pain's direct and indirect costs impact society and individuals. On a societal level, chronic pain leads to increased costs of medical treatment, disability services, legal fees, and lost work (Turk & McCarberg, 2005; Walid et al., 2018). The cost of chronic pain is estimated to be between $150 billion and $250 billion annually in the United States (Macchia & Oswald, 2021). Chronic pain affects more than 76 million Americans annually and has been identified as the second most common reason for seeking medical treatment by a physician (Davidhizar & Giger, 2004; Sharma et al., 2020). Problems often arise in chronic pain patients when they increase their activity level, which results in immobility, dependence on others, and social isolation. This exacerbation of pain can impact the individual's lifestyle, productivity, and social relationships (Arendt-Nielsen et al., 2018; Breivik et al., 2006; Clauw et al., 2019; Kress et al., 2015).

The initiation of multidisciplinary short-term intensive pain treatment programs has allowed treatment of this complex issue by diverse types of health care professionals

(medical and psychological) working in the same location. Although there is evidence that multidisciplinary short-term intensive pain treatment programs can be beneficial, understanding the factors that predict their success remains a nascent field of research (Cormier et al., 2016; de Rooij et al., 2013; Svanberg et al., 2017). Multiple factors have been demonstrated to influence pain and treatment outcomes, including psychological distress, comorbid illness, self-efficacy beliefs, fear-avoidance beliefs, avoidance behaviors, treatment expectations, sociodemographic factors, depression, and anxiety (Cormier et al., 2016; de Rooij et al., 2013; Svanberg et al., 2017).

Although some factors that predict success in multidisciplinary short-term intensive pain treatment programs have been identified, the role of the timing of treatment entry had not been examined in the literature as a potential predictor of treatment outcome. Timing may be important because it plays a role in the treatment of chronic conditions and the probability of returning to work after an injury (Gilbert, 2021; Shaw et al., 2017). I sought to fill this research gap and examine whether individuals with chronic pain who are admitted into these programs during the first 12 months after an injury are more or less likely to have improved function leading to a return-to-work compared to those who start the program 13 months or longer after an occupational injury. Individuals and treatment providers may use the results of this study to make treatment decisions, which may lead to increased functioning and decreased pain. If a relationship between treatment timing and outcome is indicated, the findings may help generate social change by improving outcomes for multidisciplinary short-term intensive pain treatment programs and benefiting many chronic pain sufferers and their families.

Chapter 1 includes background information on the study, an outline of the problem, and a description of the purpose of this study. This chapter also covers research questions and hypotheses, a description of the theoretical framework, and an introduction to the nature of the study. The terms and definitions used in this current study; the assumptions, delimitations, and limitations associated with this study; and the significance of this study is also presented. This chapter concludes with a summary.

Background of the Study

Retention of injured individuals in the workforce is vital in minimizing the development of disability conviction, a mindset in which individuals focus only on what they cannot do and what might make their pain worse rather than what they are capable of (Caneiro et al., 2017). Bringing these individuals back to work can be complicated; a positive return-to-work outcome requires clear stakeholder communication and involvement (Corbière & Shen, 2007; Woodall et al., 2017). Researchers have reported that the longer an individual is out of work, the less likely they are to return-to-work. The likelihood of return-to-work drops to 50% at 6 months, 30% at 12 months, and 10% after 2 years (Shaw et al., 2017).

When occupational disability transitions into chronic pain, it can affect the well-being, functionality, productivity, and social relationships of the individual, which may lead to increased chronic pain complaints (McCoy, 2016). This creates a substantial economic and social burden for the individual and their family (Dueñas et al., 2016). Chronic pain can lead to delayed recovery, a disproportionate disability, and delayed return to function due to nonmedical reinforcers (Collie et al., 2018). Delayed recovery

may lead to permanent physical limitations and occupational devastation (Kawi, 2016). Delayed recovery may develop due to persistent pain, inadequate coping skills, catastrophizing, fear avoidance, perceived injustice, and lack of knowledge regarding pain generation (Lavoie et al., 2017). Complications such as anxiety, depression, and social isolation may arise when delayed recovery becomes an issue (Kawi, 2016).

Recovery from an injury and associated chronic pain has been a research focus, but this is a complicated topic with limited predictability (Peters et al., 2017). The prevalence of chronic pain continues to increase, substantially impacting occupational and social performance (Dick et al., 2011; O'Brien et al., 2010; M. Wilson et al., 2015). In 2021, over 100 million people in the United States were suffering from chronic pain, and approximately 21% of the global population were experiencing chronic pain (Gulseren & Kelloway, 2021). Treatment of injuries often begins with a traditional biomedical model relegating injury to its most basic physiological components (Ronzi et al., 2017). However, in addition to issues associated with physical injury, individuals may experience psychological symptoms relating to an injury that may affect their ability and desire to return-to-work. They may, for example, blame their injury on an employer's neglect or a coworker's miscalculation, or they may feel embarrassed by their careless actions. They may also feel victimized by a system they believe is not considering their best interest (Besen et al., 2017; Iles et al., 2008). It is important when addressing occupational disabilities to have buy-in, motivation to get better, and a goal of a successful return-to-work from all parties (Eklund et al., 2019).

Multidisciplinary short-term intensive pain treatment programs treat not only physical injury but also complicating psychosocial factors. These programs adopt a biopsychosocial perspective, drawing techniques from multiple fields to help individuals increase their functionality, social interaction, coping skills, and communication skills to facilitate successful reintegration into society as productive workforce members (Turk & Gatchel, 2018; Vlaeyen & Crombez, 2020). Multidisciplinary short-term intensive pain treatment programs have been demonstrated to be effective in treating chronic pain; however, there is limited knowledge regarding what predicts successful treatment in these settings (Kamper et al., 2015). Most of the research on treatment outcomes in multidisciplinary short-term intensive pain treatment settings has focused on the role of psychological variables (Kamper et al., 2015). Researchers have emphasized the contributing factors to treating chronic pain, including cognitive, emotional, behavioral, and perceptive factors (Gatchel, 2005; Kerns et al., 2011).

The timing of treatment has been demonstrated to be important in treating many medical conditions (Rysavy et al., 2015). It is not known if the timing of treatment makes a difference in chronic pain outcomes (Cancelliere et al., 2016). Early intervention for chronic pain conditions may increase the effectiveness of such treatment, providing for a faster return-to-work, lower depression, and increased function. The current study was needed to fill this important gap, and the findings may be used to improve treatment outcomes and psychological and physical functioning in individuals who suffer from chronic pain.

Problem Statement

The problem investigated in this study was that it was unknown whether the pain and disability outcomes of individuals participating in multidisciplinary short-term intensive pain treatment could be predicted by the timing of their entrance to treatment. Other demographic and treatment variables such as age, sex, highest level of education achieved, and level of occupational disability at pretreatment pain level were accounted for to address potential confounding effects.

Chronic pain is costly. Gaskin and Richard (2012) discussed the Medical Expenditure Panel Survey 2010 extrapolated data and estimated that the cost of pain-related health care increased from between $261 and $300 billion in 2008 to between $560 and $635 billion in 2010. Understanding whether the timing of entrance into a multidisciplinary short-term intensive pain treatment program makes a difference in outcome may inform the decision-making process regarding treatment options and may lead to more effective treatment of individuals who suffer from chronic pain.

Several researchers have noted psychological symptoms such as psychological distress, comorbid illness, self-efficacy beliefs, fear-avoidance beliefs, avoidance behaviors, treatment expectations, sociodemographic factors, depression, and anxiety may predict multidisciplinary short-term intensive pain treatment program outcome (Cormier et al., 2016; de Rooij et al., 2013; Svanberg et al., 2017). Moreover, age, sex, education level at pretreatment, and pretreatment pain levels significantly predict patient outcomes (Racine et al., 2020; Shaygan et al., 2019). The specific problem was that it remained unknown whether the pain and disability of individuals who participate in

multidisciplinary short-term intensive pain treatment can be predicted by the timing of their entrance to treatment as well as their age, sex, highest level of education, level of occupational disability at pretreatment, and pretreatment pain levels (Cancelliere et al., 2016; Shaw et al., 2017).

The current study addressed a gap in the literature and extended research in related areas because treatment timing had been demonstrated to be an important indicator of treatment outcomes (Shaw et al., 2017). Other outcome predictors included age, sex, and highest level of education (Shaygan et al., 2019); smoking and pain intensity (Yamada et al., 2019); psychological factors such as stress, anxiety, and depression (Linton et al., 2018); and level of occupational disability at pretreatment (Yamada et al., 2019). In the current study, I included the predictor variables addressed by Shaygan et al. (2019) and Yamada et al. (2019), specifically age, sex, education level, and occupational disability at pretreatment. This limitation was due to the use of archived data, which did not include psychological variables. In Chapter 2, I discuss the importance of demographic variables in predicting the outcome of treatment in similar programs.

Purpose of the Study

The purpose of this quantitative nonexperimental study was to use archival data to examine whether the timing of entry into a multidisciplinary short-term intensive pain treatment program predicts pain and functioning levels at posttreatment. The study's results may illustrate the predictive power (or lack thereof) of timing of entry in predicting the success of multidisciplinary short-term intensive pain treatment program

enrollment. This may contribute to the growing body of knowledge regarding the predictors of multidisciplinary short-term intensive pain treatment program success and may have practical implications concerning whether injured workers should be encouraged to undertake similar management programs earlier or later in their recovery period, providing benefits to both workers and employers. Three independent multidisciplinary short-term intensive pain treatment programs based in the Pacific Northwest region of the United States provided archived data for the study.

Research Questions and Hypotheses

The study was guided by two research questions and corresponding null and alternative hypotheses:

RQ1: What is the combined effect of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance in accounting for variance in posttreatment and disability levels?

H_o1: The combined effect of the proportion of variance explained by a set of predictor variables in accounting for the posttreatment variables is zero.

H_a1: The combined effect of the proportion of variance explained by a set of predictor variables in accounting for the posttreatment variables is greater than zero.

RQ2: What are the relative effects of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance in accounting for variance in posttreatment pain and disability levels?

H_o2: The relative effects of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance account for no variance in posttreatment pain and disability levels.

H_a2: The relative effects of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance account for significant variance in posttreatment pain and disability levels.

Theoretical Framework

The theoretical framework to be used in the study was the choice theory, which was developed by W. Glasser (1998). Choice theory focuses on individuals' internal motivations (Glasser, 1998). This theory allowed for examining the timing of early treatment for injured workers and any effect this choice may have on their thoughts, behaviors, and treatment outcomes. Understanding personal control gives the individual the power to manage their pain condition and is a commonality between choice theory and multidisciplinary short-term intensive pain treatment programs.

W. Glasser (1998) explained through the choice theory that individuals choose how they behave, think (directly), and feel both emotionally and physically (indirectly). This includes distress and suffering. In chronic pain, choice theory posits that a considerable amount of what happens in the body is an unintended result of actions or thoughts (Glasser, 1998). When an individual is injured because of the physical pain felt from this injury, the individual may believe that being physically active will increase their physical pain. If the individual makes the choice to be physically inactive, this can lead to feelings of depression, anxiety, inadequacy, and lowered self-esteem. This leads

to physical deconditioning, which increases physical pain with lowered activity threshold. As this pattern continues, the individual has a change in status from acute to chronic pain. Chronic pain may exacerbate pain responses, extreme fatigue, and physical limitations (Arnstein, 2000).

Submitting to the belief that outside forces control a person creates the illusion of helplessness (Powell, 2004). Internalizing this helplessness, perhaps the hallmark of disability conviction, results in a situation in which a person becomes so caught up in the idea of their disability that the perception of external control manifests as hopelessness (Powell, 2004). When considering the individual's perception of the pain signals in conjunction with a lack of confidence to manage, cope, and function with pain and the addition of a facilitating agent, treatment timing may significantly influence the development of the disability mindset and depression. W. Glasser (1998) described these external forces as disconnecting habits or external control. When individuals can shift this locus of control from external to internal, W. Glasser and choice theory postulate a positive impact on the individuals' behavior and thoughts.

Early use of evidence-based, multidisciplinary short-term intensive pain treatment programs may give individuals the tools to lower perceived pain levels through education, physical and occupational therapies, psychological interventions, and medication management. Given the spiral of pain and disability predicted by choice theory when the choice of decreased activity is made, I predicted by this theory that early entry into multidisciplinary short-term intensive pain treatment programs would be related to overall improved functioning and decreased pain levels in comparison to those

who delay entry into such programs. More detail about choice theory and how it applies to the research is presented in Chapter 2.

Nature of the Study

The study was a quantitative nonexperimental study using archived de-identified data from three multidisciplinary short-term intensive pain treatment programs based in the Pacific Northwest region of the United States comprising over 500 patients no more than 7 years after injury. These programs are independent from each other and use the same approach in their treatment programs. Data gathered between 2012 and 2019 were used to examine whether the timing of admission concerning injury was related to function and pain outcomes. The research methodology was quantitative. Quantitative research is ideal for examining relationships between quantifiable variables (Bryman, 2016). Quantitative research can result in empirically strong conclusions by including streamlined, quantitative instrumentation to collect closed-ended data that are feasible to analyze for large populations, making it the preferred approach when such instrumentation and large study populations are available (Bryman, 2016).

Furthermore, quantitative research is effective when the issues under study are well-illuminated by existing theories that can guide the study. All of this was true for the current study. Both research questions pertained to the nature of the relationships between variables, which were easily quantified by the research instruments used to evaluate the success of multidisciplinary short-term intensive pain treatment programs. Furthermore, choice theory (see W. Glasser, 1998) and existing literature informed the

research questions and hypotheses to be tested. Thus, a quantitative approach was ideal for this study.

I used a nonexperimental survey design. The nature of the study design did not allow for causal attributions because the groups may have differed on several variables besides the independent variable of interest. However, the design allowed me to use a convenient archival data set. I included demographic information in the data analysis. Occupational disability level was assessed by a physical examination at the time of entrance and again at discharge. The time of treatment entry was calculated in months, and pain level was measured as an ordinal variable based on the self-rated pain scoring.

Archival records were collected from three different multidisciplinary short-term intensive pain treatment programs treating patients in the Pacific Northwest, all of which had similar approaches to treatment. Self-report questionnaires completed by the individuals treated at these programs for chronic pain issues were accessed for the current study. These data were collected by each facility and were available in the archived records. The records were de-identified at the multidisciplinary short-term intensive pain treatment clinics and provided to me electronically.

The independent variables were length of time after injury before entry into the multidisciplinary short-term intensive pain treatment program and the demographic and pain variables of age, sex, education level, pretreatment disability, and pain level, whereas the dependent variables were posttreatment disability and pain levels. Multivariate linear regression analyses were used to determine whether there was a predictive relationship between the independent variables (age, sex, education level,

pretreatment disability and pretreatment pain level, and entrance timing) and the dependent variables (posttreatment occupation disability and pain levels).

Definitions

Chronic pain: Identified by the ACPA (2021) as pain lasting longer than 3 to 6 months and negatively affecting the individual's well-being or pain that continues when it should not.

Delayed recovery: A disproportionate disability and delayed return to function due to nonmedical reinforcers (Collie et al., 2018).

Disability: A condition that makes it more difficult for a person to perform certain activities or effectively interact with others (Caneiro et al., 2017).

Injured workers: Workers who have sustained a work-related injury resulting from their jobs, which interferes with their ability to continue doing those jobs (Ronzi et al., 2017).

Multidisciplinary short-term intensive pain treatment program: Complex interventions that include a biopsychosocial model to help individuals increase their functionality, social interactions, coping skills, and communication skills to facilitate successful reintegration into society as productive workforce members (Turk & Gatchel, 2018). These programs are comprehensive short-term intensive programs (3–4 weeks) designed for each patient's specific needs. They consist of an in-house rehabilitation team including a medical physician, pain psychologist, vocational counselor, and occupational and physical therapists who all function in the same location.

Assumptions

Assumptions are propositions that a researcher takes as givens. Such statements are assumed to be true and necessary for the study to be meaningful but are not tested (Merriam & Tisdell, 2015). Several assumptions were inherent in the current study. First, I assumed that quantitative methodology would provide real and meaningful conclusions regarding the ability of multidisciplinary short-term intensive pain treatment programs to treat chronic pain. This assumption was inherent in the quantitative design. Second, I assumed that assessment and treatment were relatively uniform across facilities, and that all data used were collected and reported before and after treatment. Third, I assumed that the chosen time periods were appropriate for analysis. Fourth, I assumed that the chosen outcomes represented an appropriate means of measuring the results of multidisciplinary short-term intensive pain treatment programs for injured workers. Finally, I assumed that the programs' approach in supplying the data had not changed substantively during the time frame for which the study data were collected. Although the breadth and specificity of the outcomes chosen supported this assumption, they did not ensure it.

Scope and Delimitations

Delimitations represent the soft limits of a study or those boundaries inherent in the choice of the research problem, population, and other methodological factors chosen by the researcher. Researchers intentionally set boundaries for what is studied (Bryman, 2016). The current study was delimited to three multidisciplinary short-term intensive pain treatment programs used in the Pacific Northwest to treat chronic pain. Geographic location was limited in this study to the Pacific Northwest because I am from this area

and have specific knowledge and experience with these agencies through injured worker participation in these programs. Additionally, the study was delimited to work-related injuries because the ability of multidisciplinary short-term intensive pain treatment programs to affect these injuries and their corresponding work outcomes was the study's objective. Data collection was delimited to the selected multidisciplinary short-term intensive pain treatment programs from which de-identified data were available for analysis. The study was also delimited to 7 years from 2012 to 2019.

Another delimitation was associated with the measures and data collection corresponding to the quantitative research method. Occupational disability level was assessed by a physical examination at the time of entrance and again at discharge. The time of treatment entry was calculated, and pain level was measured as an ordinal variable based on the self-related pain scoring. The data collected were delimited to numerical data, limiting me from collecting more detailed understanding of each study participant.

These delimitations may limit the generalizability of the results to the specific types of multidisciplinary short-term intensive pain treatment programs examined in the study and the geographic area of the Pacific Northwest. However, this limitation was acceptable given the exploratory nature of the research and it being the first study to examine the time of treatment as a predictor of multidisciplinary short-term intensive pain treatment program success. Future researchers may address these delimitations by carrying out similar research in other contexts or on a larger scale, and qualitative

research could be conducted to access more detailed and nuanced information about treatment seeking in chronic pain sufferers.

Limitations

Limitations are the study's hard methodological limits. Given the methodological circumstances, limitations represent the study design's weaknesses and unavoidable barriers (Merriam & Tisdell, 2015). Self-reported data potentially limited the current study, as in to other studies that rely on participants' subjective evaluations. However, this limitation was unavoidable because there was no better or more objective way of measuring pain, much less chronic pain. The study was also limited by its use of historical data. Although these data were valuable and easily accessible, using them limited my ability to enforce inclusion or exclusion criteria except according to available demographic data, and limited the type and kinds of data that could be collected to those present in the historical records of the programs under study.

Significance

The findings of the current study may have a significant impact on individuals, their families, health care providers, and society. The development of a chronic pain disability is a lengthy process involving contextual factors such as development of psychological conditions, and learning principles (Linton et al., 2018). These factors need to be better understood to understand how pain disability evolves in one individual and not another. The knowledge gained from the current study may be used to assist in the development of appropriate treatment regimens (see Linton et al., 2018). Although the timing of treatment has important implications for other chronic conditions such as

addiction (Harris et al., 2018), it has not yet been examined as a predictor of multidisciplinary short-term intensive pain treatment program success in treating injured workers. The timing of treatment entry is a controllable factor. Therefore, the current study filled a gap in the academic and practical knowledge that may provide a better understanding of treating individuals with chronic pain and disability more effectively.

Chronic pain associated with occupational disability impacts the lives of individuals, their friends, their families, and their employers (Kosny et al., 2018). Beyond the workers themselves, families can be affected by watching loved ones deal with pain from an occupational injury (Kosny et al., 2018). Improving functioning and well-being in individuals may help minimize the strain the family unit feels. Knowledge regarding whether treatment timing makes a difference in outcomes may be useful for health care providers to educate and advise their patients and clients. Any research focusing on improving outcomes for individuals with chronic pain also has strong implications for social change given the impact and cost of chronic pain on society.

Summary

In Chapter 1, I addressed the problem of insufficient knowledge regarding the predictability of pain and disability outcomes in individuals participating in multidisciplinary short-term intensive pain treatment programs. I aimed to investigate whether several factors, including the timing of entrance to the treatment, age, sex, highest level of education, level of occupational disability at pretreatment, and pretreatment pain levels served as predictors of pain and disability at posttreatment. The focus of this research was the gap in the literature regarding the role of the timing of

treatment. No researchers had examined whether the time between injury and entrance into a multidisciplinary short-term intensive pain treatment program could predict outcome in that program. The study was guided by choice theory (see W. Glasser, 1998). I used de-identified archival data from three multidisciplinary short-term intensive pain treatment programs in the Pacific Northwest from 2012 to 2019 to answer the research questions. In Chapter 2, the study's context is explored in greater depth. This includes a more in-depth description of the theoretical framework, a thorough review of related academic and professional literature, and a restatement of the research gap that this study filled.

Chapter 2: Literature Review

The purpose of this study was to investigate whether the pain and disability of individuals who participate in multidisciplinary short-term intensive pain treatment can be predicted by the timing of their entrance to treatment, their age, their sex, the highest level of education they achieved, their level of occupational disability at pretreatment, and their pretreatment pain levels. Chronic pain contributes to the suffering of more than 50 million Americans, with 19 million reporting pain significantly affecting function (ACPA, 2021; Dahlhamer et al., 2018; National Center for Health Statistics, 2017). If appropriate and timely treatment can predict outcomes, it may inform continued research and individual treatment decisions. The knowledge gained from the current study may inform treatment decisions that benefit patients, their families, and health care providers.

An examination regarding whether a connection exists between entrance timing and function was a reasonable pursuit in this field of research, given the published literature. This chapter includes a review of research related to chronic pain and pain management. The literature search strategy is presented first, followed by the theoretical foundation and a literature review regarding the critical variables and concepts relevant to the current study. This includes conceptualizing chronic pain, chronic pain in work injuries, chronic pain treatment, multidisciplinary short-term intensive pain treatment, and early interventions. Chapter 2 concludes with a summary and outline of key points.

Literature Search Strategy

To identify studies related to the research topic and purpose of the current investigation, I performed a literature search of the Google Scholar, PubMed, and

Academic Search Complete databases. To build a foundation for conducting the research on multidisciplinary short-term intensive pain treatment, I also conducted a thorough literature search on the effectiveness of multidisciplinary short-term intensive pain treatment; the psychological predictors of pain outcome; nonphysiologically predictors of pain outcome; and age, sex, and education in pain outcome. The following search terms and phrases were used: *entrance timing, multidisciplinary, multidisciplinary pain treatment, pain management, chronic pain, occupational disability, psychological predictors, nonpsychological predictors, age, sex, education*, and *early intervention*. Boolean logic was used to expand or narrow the searches when necessary.

The studies included in the review matched the search terms, and a review of the titles and abstracts confirmed their applicability to the current study. Most of the studies were published within the past 5 years, and older studies were determined to be applicable based on the number of citations or impact on the field. The reviewed studies were published in peer-reviewed academic publications and available in full-text English language versions. Based on the search criteria, 96 studies were eligible for inclusion in the review. Of the 96 studies, 86 (90%) had been published since 2014, and 11 (10%) had been published before 2014 and were considered to be guiding.

Theoretical Foundation

The theoretical framework used in this study was choice theory developed by W. Glasser (1998). Choice theory focuses on individuals' internal motivations for selecting specific actions over others (C. Glasser, 2003). Personal control is a critical component of choice theory (W. Glasser, 1998). W. Glasser explained that individuals make choices

directly through how they behave and think and indirectly through how they feel emotionally and physically. According to the tenets of choice theory, humans have basic needs (survival, love, belonging, freedom, power, and fun) that dictate choices and are both physical and psychological (W. Glasser, 1998). The theory also posits that all behavior is purposeful to meet those basic needs (W. Glasser, 1998).

As applied to the current study, choice theory allowed me to look at the timing of treatment in chronic pain sufferers and the influence this choice may have on the outcome. Choice theory was used to predict that when an individual is injured, they may believe that being physically active will increase physical pain. If the individual chooses to be physically inactive, this could lead to feelings of depression, anxiety, inadequacy, or lowered self-esteem. This may lead to physical deconditioning, thereby increasing physical pain, lowering activity threshold, and contributing to further physical deconditioning. Arnstein (2000) discussed how as this pattern continues, the injured individual has a change in status from acute to chronic pain. Chronic pain may exacerbate pain response, extreme fatigue, and physical limitations.

Chronic Pain and Coping

The inability to cope with pain using practical adaptation activities or emotional coping skills increases pain related behavior and is associated with negative emotional outcomes (Higgins et al., 2015). Researchers have demonstrated that passive coping behaviors such as hoping the pain goes away or inactivity increase catastrophic thinking, mental distress, and an inability to function physically and emotionally (Alschuler et al., 2013; Carroll et al., 2014; Higgins et al., 2015; LaChapelle & Hadjistavropoulos, 2005).

These passive maladaptive coping behaviors reflect what Chen and Jackson (2018) referred to as “dysfunctional expectancies” (p. 1) and are often found in individuals with an external locus of control (Chen & Jackson, 2018). Choice theory (W. Glasser, 1998) addresses external locus of control by acknowledging the belief that individuals have little control over other people or factors. Instead, the focus is placed on an internal locus of control, referring to the belief that individuals have some degree of personal control over outcomes (Gardner et al., 2018; Keedy et al., 2014; Schmidt, 2016).

A chronic pain sufferer who has an internal locus of control may fear that being physically active will lead to increased pain; however, the individual may also be more likely to choose to be physically active compared to those with an external locus of control because they believe that what they choose to do has some impact on health outcomes (Keedy et al., 2014). Increased activity is then reinforced as the individual realizes increased functionality and engagement with social and familial networks. Individuals with an internal locus of control are more likely than those with an external locus of control to manage the pain and fear instead of allowing those factors to control them (Keedy et al., 2014).

The perceived level of control over one’s choices, such as being active, may be useful in predicting treatment success. A lack of perceived individual control negatively impacts intervention success (Keedy et al., 2014; Schmidt, 2016). External locus of control may lead to feelings of helplessness (Powell, 2004). Internalized helplessness, the hallmark of disability conviction, results in an individual becoming caught up in the idea of external control and self-perceived inability to affect the situation, which may impact

depression (Powell, 2004). When considering an individual's perception of pain in conjunction with confidence levels in managing, coping, and functioning with pain, earlier entrance to treatment may minimize the development of the disability mindset and depression. Providing early exposure to a multidisciplinary short-term intensive pain treatment program may encourage the facilitation of internal locus of control mechanisms and may minimize the impact of more passive coping measures (Gatchel et al., 2014).

Theoretical Approach to Chronic Pain

The choice theory was selected for the current study because it was used to predict an association between the timing of the implementation of evidence-based multidisciplinary short-term intensive pain treatment programs and outcomes (see McCoy, 2016; Schatman, 2016). The timing of chronic pain interventions may influence the effectiveness of such treatment, leading to a faster return-to-work, lower depression, and increased functioning. W. Glasser (1998) explained that when individuals shift their locus of control from external to internal, it can positively impact their behavior and thoughts. Given the spiral of pain and disability identified by multiple researchers (Alschuler et al., 2013; Carroll et al., 2014; de Rooij et al., 2013), choice theory predicts that early entry into a multidisciplinary short-term intensive pain treatment program may be related to overall improved functioning and decreased pain levels compared to those with delayed entry. This theory also offers insight into how the decision to enter treatment may impact functioning and engagement while experiencing chronic pain.

I used choice theory to inform the research questions and hypotheses. Choice theory has been supported as a useful framework for managing pain (Pierce, 2003).

Choice theory emphasizes the role self-efficacy plays in determining patients' experiences with pain as well as their ability to cope with increased pain while they work in multidisciplinary short-term intensive pain treatment programs (Arnstein, 2000). For example, Arnstein (2000) found that self-efficacy significantly mediates the relationship between pain intensity and disability. Self-efficacy is related to locus of control, reflecting the individual's belief that they can perform certain tasks (Arnstein, 2000). Having an internal locus of control means an individual perceives that they have control over a situation, while self-efficacy reflects that individual's belief that they can do what is necessary to control that situation. Self-efficacy is a critical variable in determining perceptions of disability and recovery outcomes. Self-efficacy influences behaviors predicted by choice theory, which may influence the quality of life (Arnstein, 2000). Self-efficacy may influence behavior, influencing the quality of life in individuals with chronic pain (Arnstein, 2000). Choice theory has been used to guide chronic pain management strategies based on its influence on subjective and psychological conceptions of disability (Müller et al., 2016).

Powell (2004) updated the original choice theory presented by W. Glasser (1998) by focusing on internalizing the desire to change or taking responsibility for change. Powell introduced five states of responsible human behavior: willingness to change, taking responsibility for change, obtaining the knowledge needed to change, applying that knowledge, and maintaining change behavior. Powell built on W. Glasser's foundational idea that motivation must come from within to make a change, and Powell expanded on how that change takes place. W. Glasser's original model has been used to

guide chronic pain management strategies based on its influence on subjective and psychological conceptions of disability (Müller et al., 2016). Powell's expansion on the theory emphasized the importance of factors beyond the internal locus of control and self-efficacy, such as access to the information and support needed to make and maintain meaningful change.

Multidisciplinary short-term intensive pain treatment programs offer information and support, and chronic pain sufferers who can use those resources before possibly falling into the pain/disability spiral may benefit from treatment more than those who wait. Choice theory (W. Glasser, 1998) offers a promising link between traditional biomedical conceptions of pain and disability to psychological and social processes that impact behavioral choices that influence the quality of life.

Literature Review

Definition of Chronic Pain

Chronic pain persists after healing or exists without tissue damage (Hylands-White et al., 2017). Chronic pain is defined as persisting for more than 3 months (Gulseren & Kelloway, 2021). Professional organizations have differed to some degree in their conceptualizations of pain, which has led to some discrepancies in the literature about how pain is understood and measured.

The ACPA (2021) defined chronic pain as pain lasting longer than 3 to 6 months that negatively affects an individual's well-being or pain that continues when it should not. This definition was developed using peer-reviewed research and was grounded in findings from Tait et al. (1990) who developed the first pain disability index to measure

how pain impacts the ability to perform daily activities. However, some researchers have questioned the utility of conceptualizing pain as a disability and have suggested that framing pain experiences this way may lead to catastrophizing the pain experience (Timm et al., 2021; Treede et al., 2015). As a result, some researchers and organizations have sought new ways to classify pain based on subjective experiences.

The International Association for the Study of Pain defined pain subjectively as a "chronic primary pain [that] has persisted for more than 3 months and is associated with significant emotional distress and functional disability, and another condition does not better account for the pain" (Nicholas et al., 2019, para. 1). This definition places value on the subjective perception of pain and the duration of its experience as key indicators rather than the degree to which it impacts daily functioning. How pain is conceptualized, defined, and measured has a considerable influence on the determination of how it is treated (Treede et al., 2015). As a result, different treatments may influence individuals differently based on incorporating biological, psychological, and social factors.

Influence of Pain Conceptualization on the Prevalence of Chronic Pain

An important consideration concerning the conceptualization of pain and its measurement is prevalence because the rate of chronic pain in each population is influenced by how it is defined. Furthermore, the degree to which pain negatively influences social support networks and health care delivery is also influenced by how pain is conceptualized (Dueñas et al., 2016). Specifically, whether is perceived as harmful rather than a natural biological process may influence the degree to which aspects of care are perceived as important. These factors impact how health care

providers manage pain (Kawi, 2016). Chronic pain is a prevalent problem in middle childhood and adolescence (Harrison et al., 2019).

Chronic Pain in Work Injuries

Chronic pain impacts the individual, family, friends, social networks, employers, and society (Fayaz et al., 2016). The ACPA (2021) estimated that approximately 50 million Americans suffer from chronic pain and that approximately 80% of annual cumulative medical visits were for chronic pain. The Occupational Safety and Health Administration estimated that employers pay $1 billion per week for the direct costs of workplace injuries, including workers compensation payments and medical and legal services (Friend & Kohn, 2018). Chronic pain is a personally devasting phenomenon that impacts the individual and society in a costly manner.

Employers must pay the indirect costs of chronic pain by replacing employees, investigating lost productivity, repairing equipment, and conducting corrective measures (Grimani et al., 2018). The individual costs and suffering associated with chronic pain include personal health expenses and lost time from family, friends, and work (Peters et al., 2017). Treatment of injured individuals often begins with a traditional biomedical model relegating injury to its most basic physiological components (Ronzi et al., 2017). However, injured individuals often experience psychological symptoms relating to an injury that may affect their ability and desire to return-to-work or engage socially with friends and family (Ronzi et al., 2017). Those injured at work may blame the injury on an employer’s neglect or a coworker’s miscalculation and may feel resentment or embarrassment about careless personal actions. Injured individuals may also feel

victimized by a system they believe is not looking out for their best interest (Besen et al., 2017; Iles et al., 2008). It is essential when addressing occupational disabilities to have buy-in, motivation to get better, and an outcome goal from all parties (Kapoor et al., 2006; Roe, 2017).

Moens et al. (2019) identified and summarized evidence on returning to work in patients with chronic back pain treated with spinal cord stimulation. Moens et al. performed a systematic literature review to include studies from PubMed, EMBASE, SCOPUS, and Web of Science until October 2017 and assessed the risk of bias using a modified version of the Downs and Black checklist. The review included 15 full-text articles after screening a total of 2,835 articles, and Moens et al. reported that spinal cord stimulation intervention resulted in a high rate of individuals returning to work after an injury. Based on the currently available literature, the authors concluded that spinal cord stimulation is an effective approach to help individuals with chronic pain return-to-work after an injury.

Gulseren and Kelloway (2021) explored qualitative interviews regarding how 13 full-time employees with severe chronic pain experienced work. Using content analysis of the interview response, Gulseren and Kelloway revealed that active pain management was important for ensuring individuals' function at work. This finding provides a foundation for future theoretical and quantitative studies on chronic pain and work.

Returning to work with chronic pain can be complicated, requiring clear stakeholder communication and involvement (Corbière & Shen, 2007; Woodall et al., 2017). According to Shaw et al. (2017), 70% of those injured on the job return to the

workforce after two months. The likelihood of a return-to-work drops to 50% at 6 months, 30% at twelve months, and 10% after two years (Shaw et al., 2017). Researchers have also indicated that the duration of pain is related to poor treatment outcomes, concluding that the longer one suffers from pain, the less likely they are to recover (Shaw et al., 2017). Given this research, Gulseren and Kelloway (2021) recommended policy changes and organizational interventions to improve working conditions for employees with chronic pain.

Chronic pain associated with an occupational disability can substantially impact the lives of individuals and their loved ones (Linton et al., 2018). Pain as a symptom, such as that caused by musculoskeletal disorders, is a major cause of occupational disability. Yamada et al. (2019) explored the lived experience of chronic pain in 15 college students with pain via a qualitative phenomenological approach using semi structured interviews. The authors identified that chronic pain affected these students' personalities, stigma, and self-awareness. The students could push through the pain using coping strategies, pain management, and adaptations to promote social engagement. The authors suggested that, by understanding the lived experiences of patients with chronic pain, therapists could engage in an open dialogue with clients about the holistic nature of their pain.

Occupational therapy uniquely contributes to chronic pain management due to its focus on functioning (Lagueux et al., 2018; Spałek et al., 2017). Spałek et al. (2017) presented the problems connected with occupational therapy that made a major part of the programs for treating mobility limitations connected with different dysfunctions. The

authors conducted an extensive literature review and indicated that the knowledge regarding personalized medicine, rehabilitation, and occupational therapy continues to grow. Lagueux et al. (2018) contributed to this body of knowledge by documenting occupational therapy roles, models, assessments, and intervention methods used with adults with chronic pain. They reviewed 30 different interventions, with 73.3% related directly to the person, 20% about occupation, and 6.7% addressing environmental factors.

Lagueux et al. (2018) discussed the main role of occupational therapy in improving activities and participation, the Canadian Model of Occupational Performance, and the Canadian Occupational Performance Measure. They reviewed the distinction and complementarity between the bottom-up and the top-down approaches to occupational therapy interventions and highlighted occupational therapy specificity in adult chronic pain management. However, chronic pain has psychological features such as catastrophizing that make occupational therapy difficult to conduct (Spałek et al., 2017).

Catastrophic thinking has been associated with occupational disability in individuals with debilitating pain conditions (Adams et al., 2017). Adams et al. (2017) examined the relationship between catastrophic thinking and occupational disability in individuals with major depression. Using a sample of 80 work-disabled individuals with major depressive disorder referred to occupational rehabilitation services, the researchers measured depressive symptoms severity, catastrophic thinking, and occupational disability at admission and termination of a rehabilitation intervention. Adams et al. explained that catastrophic thinking contributed significant variance to the prediction of self-reported occupational disability beyond the variance accounted for by depressive

symptom severity. Reduction in catastrophic thinking predicted a successful return-to-work following the rehabilitation intervention, beyond the variance accounted for by reductions in depressive symptoms severity. The findings of Adams et al. suggest that catastrophic thinking is a strong determinant of occupational disability in individuals with major depressive disorder. They argued that interventions to reduce catastrophic thinking might promote occupational reintegration in individuals with debilitating mental health conditions.

Hara et al. (2018) investigated the feasibility of introducing a novel transdiagnostic occupational rehabilitation program in groups, mixing participants with chronic pain, chronic fatigue, and common mental disorders. The authors triangulated observational data on group climate and individual participation with qualitative data from focus group interviews on the participants' experiences with transdiagnostic groups. Self-reported chronic pain, chronic fatigue, and mental distress were prevalent, and most reported overlapping conditions (Hara et al., 2018). Transdiagnostic groups showed high participation rates, moderately high group engagement across symptom profiles, and positive participant experiences (Hara et al., 2018). Group treatment was identified as an effective and positive experience. Recommendation arose for further research to establish the feasibility of implementing transdiagnostic rehabilitation groups, their acceptability to participants, and the demand for such treatment in patients with chronic pain.

Chronic Pain Treatment

Chronic pain cannot be treated and cured in the conventional biomedical sense (Hylands-White et al., 2017). Opioid therapy is the cornerstone of treatment for acute

procedural and postoperative pain and is regularly prescribed for severe and debilitating chronic pain conditions (Wren et al., 2019). However, Wren et al. (2019) argued that although beneficial for many patients, opioid therapy might have side effects, limited efficacy, and potentially negative outcomes.

Developing a chronic pain disability is a lengthy process involving contextual factors such as response to treatment (Linton et al., 2018). Researchers have called for more social and family-oriented approaches to understand chronic pain management and address the complex factors that influence its expression and impact (Dueñas et al., 2016). Kawi (2016) also suggested that self-management should be promoted. Although theoretical approaches to understanding and designing practical approaches to pain management are equivocal, consistent support has been around many individual elements of these theories in treating chronic pain. Hylands-White et al. (2017) suggested that patients suffering from chronic pain must be given the tools to manage their long-term pain to an acceptable level.

Some evidence exists supporting the role of entrance timing in optimizing pain management outcomes and reducing the magnitude of pain, as well as the perception of disability (Harris et al., 2018; Lovett et al., 2017; Quinn & Emery, 2003; Rysavy et al., 2015). Researchers have suggested that detecting symptoms, such as length of pain complaints, intensity, and psychological issues of depression and anxiety, earlier yields more optimal pain management outcomes. Quinn and Emery (2003) reviewed several studies and concluded that pain management treatment was effective in slowing the disease process associated with rheumatoid arthritis when treatment was implemented

promptly. The authors referred to this as a therapeutic window that should be utilized to optimize care (Quinn & Emery, 2003, p. S155). This review is dated but relevant to the study. The authors noted that it was unclear if an early treatment impacted the disease process of arthritis or if it interrupted the cyclical nature of inflammation and physical damage.

Hadi et al. (2017) conducted a study to identify barriers to effective pain management encountered by patients with chronic pain within the United Kingdom's National Health Service. After employing secondary analysis of face-to-face semi structured qualitative interviews of 18 patients with chronic pain who completed treatment, Hadi et al. reported that patients were highly disappointed with the quality of pain management services provided both within primary and secondary care and consequently were willing to seek private medical care. The authors identified two main reported barriers to effective pain management: healthcare professional-related and health system-related.

Most recently, Rose et al. (2021) investigated the perceived impact and experience of long-term involvement in community-based group yoga for people with chronic pain. Rose et al. employed a mixed-methods approach with 11 participants during the 8-week yoga study and after 2 years of yoga and found Canadian Occupational Performance Measure scores significantly improved between baseline and follow-up. These researchers identified three main themes from qualitative interviews: (a) the participants described the change that took place as shifting from "existing" to "living"; (b) the change process was progressive; and (c) yoga was viewed as a positive thing.

Overall, the studies reviewed suggested that treatment focused on the entire person may be the most effective way to approach chronic pain. Timing may also be an important part of treatment, and the sooner the problem is addressed, the more effective treatment may be. No researchers to date have specifically investigated if treatment timing is a significant predictor of outcome in this patient population.

Entrance Timing and Early Intervention

The substantial negative impact associated with chronic pain and occupational disability underscores the importance of interventions to reduce the burden of pain (Moens et al., 2019). Patients have no control over variables such as age, the severity of pain and disability, and psychological characteristics; thus, researchers need to focus on controllable variables, such as entrance timing. Although chronic pain has multiple and complicated relationships with various variables, entrance timing may be critical in determining rehabilitative success (Shaw et al., 2017). Entrance timing is important in the treatment of most medical conditions (Rysavy et al., 2015), including rheumatoid arthritis (Quinn & Emery, 2003), treatment of addiction to drugs and alcohol (Harris et al., 2018), and cardiovascular disease (Murphy et al., 2017).

Positive early interactions between the patient and their treating providers have been shown to increase the effectiveness of care and overall improvement (Castelnuovo & Schreurs, 2019). Although the evidence is clear for other medical conditions, the role of entrance timing in chronic pain is not understood. Some individuals may benefit from early interventions by developing an internal locus of control and self-efficacy, which in turn allows them to push themselves to participate in activities that cause discomfort,

because they start to believe that they may benefit from those activities in the longer term. As discussed previously, entrance timing may also be important for pain management, as earlier treatment may be associated with more favorable treatment outcomes. Chronic pain sufferers have little to no choice in many factors that may impact treatment outcomes, but they do have choices regarding treatment. Treatment entrance timing itself may be an important and controllable predictive factor in chronic pain outcomes, and it is vital to pursue research that investigates its role in the pain and disability of those who engage in multidisciplinary short-term intensive pain treatment programs.

Researchers have shown that treatment is important in minimizing disability in chronic pain (Jurisic et al., 2017). However, contextual issues such as whether the patient resides in an urban versus rural setting can significantly impact treatment timing (Lavoie et al., 2017). Living in a rural community can lead to reduced access to and delayed intervention (Lavoie et al., 2017). Additionally, practitioners may be unable to deliver the most evidence-based care if patients opt for an alternative pain management approach. As a result, it is difficult to control the timing of current interventions designed to manage chronic pain. Further research is needed to determine if there is optimal entrance timing for managing chronic pain in general, as well as timing, influences subjective pain experiences, catastrophizing, and perceptions of disability.

Early pain treatment is a priority in acute pain, such as pain related to surgery. Chronic postsurgical pain is an unwanted adverse event in any operation (Thapa & Euasobhon, 2018). Thapa and Euasobhon (2018) described preventive postsurgical pain

strategies, including modification of the surgical technique, good pain control throughout the perioperative period, and preoperative psychological intervention focusing on the psychological and cognitive risk factors. Voltage-dependent calcium channel antagonists, antidepressants, topical lidocaine, and topical capsaicin are the main pharmacological treatments for postsurgical pain (Thapa & Euasobhon, 2018). Other drugs that may be helpful are ketamine, clonidine, and intravenous lidocaine infusion (Thapa & Euasobhon, 2018). Single modality treatment, such as medication alone, can be effective for short-term pain; however, when an individual suffers from pain over months or years, the pain and its treatment can become more complicated. Thapa and Euasobhon suggested adequate preoperative counseling regarding the surgery and expected outcomes could alleviate stress and help prevent chronic postsurgical pain. Identifying psychologically vulnerable patients and early interventions pre- and postoperatively might help prevent the development of chronic pain in chronic postsurgical pain patients.

Predicting treatment outcomes based on demographic or pain factors can prove beneficial in the development of more robust treatment approaches. Pagé et al. (2017) suggested that early identification of patients whose condition could not be improved with multidisciplinary short-term intensive pain treatment through examination of baseline characteristics and rates of change in pain scores could provide valuable information about prognosis and open the doors for evaluation of different cost-effective treatment approaches. However, little is known about the relation of entrance timing to outcome in interventions incorporating psychological interventions such as

multidisciplinary short-term intensive pain treatment programs (Svanberg et al., 2017; Veehof et al., 2016).

Researchers have demonstrated that psychological processes significantly influence the progression of pain symptoms (Turk & Gatchel, 2018), implying that entrance timing may play a central role in rehabilitative success in managing chronic pain (Svanberg et al., 2017; Veehof et al., 2016). Understanding the role entrance timing to multidisciplinary short-term intensive pain treatment programs plays for patients with chronic pain may provide an unrecognized asset to the treatment regimen for these patients and improve recovery outcomes. The research on treatment timing may benefit the field by providing information that may help patients and treatment providers who help guide patient decisions regarding treatment options.

Multidisciplinary Short-Term Intensive Pain Treatment

Treatment approaches for chronic pain vary due to different conceptualizations, different health beliefs across different cultures, and differences in healthcare systems (Lavoie et al., 2017). Chronic pain carries a significant impact and is difficult to treat, with limited success (Wilson, 2017). A singular approach to pain management cannot address all the mediating and moderating variables that determine treatment success. Hylands-White et al. (2017) provided an overview of treatment approaches available for managing persistent nonmalignant pain. These authors discussed providing relief from the physical aspects of pain through the judicious use of analgesics, interventions, simulations, and distraction. They also discussed how the pain clinic they ran offered a biopsychosocial approach to treatment with a multidisciplinary short-term intensive pain

treatment program and how they perceived this approach as the most effective (Hylands-White et al., 2017).

The biopsychosocial model of pain accounts for the complex interplay of biological, psychological, social, and environmental factors and how this interplay contributes to and maintains pain and disability (Harrison et al., 2019). This type of treatment approach combines providers with different modalities to form a cohesive team under the same roof, to manage the treatment of chronic pain (Ronzi et al., 2017). Multidisciplinary short-term intensive pain treatment programs optimize treatment by delegating professional roles and responsibilities across multiple disciplines, allowing practitioners to intervene consistently throughout the patient's rehabilitation and work as a team (Gatchel et al., 2014).

Multidisciplinary Short-Term Intensive Pain Treatment Effectiveness

Multidisciplinary short-term intensive pain treatments incorporating pharmacological and integrative nonpharmacological therapies are effective in acute and chronic pain management for pediatric populations (Wren et al., 2019). A multidisciplinary approach can benefit psychological functioning and quality of life and may also have the potential to reduce reliance on opioids (Wren et al., 2019). Treatment goals associated with multidisciplinary short-term intensive pain treatment programs address the biomedical symptoms of pain as well as the psychological and social factors that determine rehabilitative success (Fedoroff et al., 2014; Gatchel et al., 2014; Kamper et al., 2015; McCoy, 2016; Salathé et al., 2018; White et al., 2018). Physical therapy, cognitive behavioral therapy, and lifestyle modifications are useful for relieving the pain

and distress experienced by chronic postsurgical pain patients (Thapa & Euasobhon, 2018). There is a consensus among researchers that a multidisciplinary approach is optimal for treating chronic pain (Ronzi et al., 2017).

Multidisciplinary short-term intensive pain treatment programs may be more effective in treating chronic pain than standard medical care alone, due to their ability to address multiple factors that affect patients' pain (Cancelliere et al., 2016; Cormier et al., 2016; Kapoor et al., 2006; Peters et al., 2017; Woodall et al., 2017). Multidisciplinary short-term intensive pain treatment programs are potentially more efficacious than standard physical care because of the combination of treatment modalities. Medical factors, social factors, communication between patients and healthcare providers, the level of patient engagement that exists with the treatment approach, and the degree to which the patient responds to self-management, may all significantly influence treatment outcomes (Chou et al., 2016; Fedoroff et al., 2014; Hadi et al., 2014; McCormick et al., 2015; Visser et al., 2016).

Harrison et al. (2019) described the state of the art of rehabilitation approaches to treat persistent pain in children and adolescents. The authors indicated that multidisciplinary treatment was important, with intensive interdisciplinary pain rehabilitation effectively reducing disability for patients with high levels of functional disability. Harrison et al. also highlighted the importance of researching emerging interventions to guide future research and clinical practice.

Factors that predict positive treatment outcomes in multidisciplinary short-term intensive pain treatment include more education, higher socioeconomic status, high self-

efficacy, positive expectations, less severe injury or pain, and increased coordination of work with treatment (Cancelliere et al., 2016; Kapoor et al., 2006; Peters et al., 2017; Woodall et al., 2017). A multidisciplinary short-term intensive pain treatment approach to pain management addresses a range of factors that impact chronic pain and sets active treatment outcomes such as return-to-work, pain flare coping plans, goals setting, and problem-solving in contrast to interventions that are delivered individually (e.g., physical treatment alone), which may focus only on goals associated with that specific treatment modality. Multidisciplinary short-term intensive pain treatment programs are better equipped than medical care alone to address the psychological influences on pain management, such as self-efficacy and expectations about care outcomes. However, there is a great deal of outcome variability in these programs. Wilson (2017) found that these treatment programs significantly benefited some patients' functioning but had relatively little impact on the pain. Wilson also indicated variability among patients, pain types, and benefits. Only approximately a third of patients showed improvement.

In contrast, in a recent Cochrane review, recognized as the standard for conducting systematic reviews and meta-analysis, Kamper et al. (2015) concluded that multidisciplinary short-term intensive pain treatment effectively treats pain and disability. These researchers conducted a systematic review and meta-analysis of 41 studies that adopted a multidisciplinary approach and found that multidisciplinary care was significantly more effective than standard care alone in reducing pain. The authors compared studies of three treatment strategies for chronic low back pain, including intensive and multidisciplinary treatment, less intensive outpatient treatment, and mixed

strategies combining these two previous approaches. They found no significant difference between these three approaches in terms of work outcome, but there was a difference in pain and functioning, with the intensive and multidisciplinary groups showing significantly more improvement than the other two treatments (Kamper et al., 2015). All three treatments successfully reduced sick leave duration across the sample of 159 patients.

Systematic reviews and meta-analyses of multidisciplinary short-term intensive pain treatment programs have found at least moderate effects for symptom reduction, reduced time to return-to-work, and reduced conceptions of disability compared to physical treatment alone (Gatchel et al., 2014; Kamper et al., 2015). Gatchel et al. (2014) reported that this approach reduced rehabilitation costs. Kamper et al. (2015) also concluded that multidisciplinary short-term intensive pain treatment programs were significantly more effective and efficient than usual care.

Pagé et al. (2017) aimed to identify subgroups of patients sharing similar pain severity trajectories over time and predictors of multidisciplinary short-term intensive pain treatment responsiveness in a group of 1,894 patients enrolled in the Quebec Pain Registry with moderate to severe baseline pain severity. Participants in the study completed questionnaires on pain and related constructs before initiating treatment, and 6, 12, and 24 months later. Pagé et al. conducted trajectory analyses of pain severity and showed that a three-class model best fit the data. Two of the trajectories, which included 24.5% of patients, showed significant improvement in pain severity levels over time (Pagé et al., 2017). Compared to patients in the non-improving trajectory, improvers were

younger and more likely to suffer from neuropathic pain, with the pain of shorter duration, lower worst pain intensity, lower sleep disturbances and depression scores at baseline, a lower tendency to catastrophize, and better physical health-related quality of life (Pagé et al., 2017). There is a great deal of variability in the outcomes of multidisciplinary short-term intensive pain treatment, with only some patients reporting significant pain relief. Given these findings, it is important to continue identifying predictive factors in treatment outcomes.

Wilson (2017) revealed a great deal of heterogeneity between multidisciplinary approaches and the outcomes measures used in these programs and reported that the extent and duration of benefit was inconsistent. Given the large time and energy investment required of patients, staff, and commissioners in this type of treatment, the author recommended further research into differentiating between clinically important subgroups and comparing how these subgroups respond to interventions.

In response to calls for continued study, researchers have begun to develop models of multidisciplinary care that focus specifically on psychosocial processes and outcomes involved in pain management, such as coping skills and quality of life (Brunault et al., 2016; Nicholas & Blyth, 2016; Outcalt et al., 2015); however, these interventions have yet to be tested empirically. Treatment timing may be important in the context of also having the appropriate combination of strategies, and the study investigated the role of entrance timing as a predictor of outcome in multidisciplinary short-term intensive pain treatment program treatment of chronic pain. Reduction in pain following multidisciplinary short-term intensive pain treatment is most often associated

with reduced disability (Shaygan et al., 2019). Shaygan et al. (2019) supported a cognitive behavioral model of pain that posited an important role for pain-related cognitive and emotional processes in long-term outcomes following multidisciplinary pain treatment, particularly for the modulation of disability due to pain. The results of Shaygan et al. (2019) add evidence to support the notion that pain-related cognitions are dynamic features varying over time, dependent on the internal situation.

Psychological Predictors of Pain Outcome

Chronic pain develops over time and is impacted by numerous contextual factors (Linton et al., 2018). Researchers have highlighted the need for more significant consideration of the psychological influences on pain etiology to guide treatment (Linton et al., 2018). The development of a chronic pain disability also involves psychological factors such as stress, anxiety, depression, and behavioral or social learning, regarding disability (Linton et al., 2018).

Researchers have examined various possible predictors of pain and disability in disabled workers. For example, Yamada et al. (2019) examined whether smoking and pain intensity were associated with pain-related occupational disability in 1,189 Japanese workers with pain. Using an ordinal logistic regression model and conducting a multiple mediation analysis, the authors indicated that current smoking and pain were more associated with pain-related occupational disability compared with non-smoking and pain. Yamada et al. also revealed that greater pain intensity partially mediated the association of current smoking and pain with pain-related occupational disability.

Psychological aspects of pain, such as stress, anxiety, and depression, can magnify perceptions of pain severity (Linton et al., 2018). Researchers have explored the influence of psychological factors in pain management intervention outcomes (Narayan et al., 2017; Thompson, 2017; Thomtén et al., 2016; Turk & Gatchel, 2018). In addition to self-efficacy and expectations about care, depression, anxiety, fear-avoidance, perceived disability, and pain, catastrophizing significantly affected chronic pain outcomes (Narayan et al., 2017; Thompson, 2017; Thomtén et al., 2016; Turk & Gatchel, 2018).

Researchers have shown that incorporating individual self-management and psychological factors may influence pain perception and treatment response (Chou et al., 2016; Fedoroff et al., 2014; Hadi et al., 2017; McCormick et al., 2015; Visser et al., 2016). Studying these factors may help researchers develop a more thorough understanding of how pain disability evolves in one individual and not another, as well as effective treatments (Linton et al., 2018). Ang et al. (2010) discussed how pain might trigger depression, and how depression may amplify pain signals leading to more avoidant behavior (Ang et al., 2010; Shindo & Yamakage, 2021). The longer this cycle continues, the more severe depression and avoidant behavior may become. Individuals with comorbid depression and pain have significantly worse treatment outcomes than those with pain or depression alone (Dhanju et al., 2019). Targeted treatment of chronic pain patients with complications such as depression or avoidant behavior may allow for concurrent management, possibly minimizing or delaying the development of chronic pain (Ang et al., 2010; Dhanju et al., 2019).

Several researchers have noted that psychological symptoms such as self-efficacy beliefs, fear-avoidant beliefs, avoidance behaviors, treatment expectations, depression, and anxiety may predict chronic pain treatment outcomes (Besen et al., 2017; Cormier et al., 2016; de Rooij et al., 2013; Svanberg et al., 2017). For example, Besen et al. (2017) assessed pain catastrophizing, or perceptually magnifying the experience of pain, in 241 individuals with pain-related functional disabilities. The authors found that individuals who catastrophized about their pain experienced more work limitations and longer recovery times than those who did not catastrophize about their pain (Besen et al., 2017).

In a systematic review of 21 studies looking at the role of fear-avoidance on the development of chronic low back pain, Wertli et al. (2014) reported that depression, pain catastrophizing, and outcome expectations, appear to be strongly related to fear avoidance. An individual's belief system regarding pain may affect outward mobility. Thus, cognitions of worsening pain could lead to avoidance of recovery-based activities (Demmelmaier et al., 2018).

Negative thought processes, according to Demmelmaier et al. (2018), may lead to increased hypervigilance, depression, and increased pain. Each of these components interacts with the others, increasing fear avoidance behavior. For example, if an individual with chronic pain does not experience the pain relief outcome expected, they may develop depression. Depressive cognitions may lead to increased pain catastrophizing or the belief that the pain will increase with the slightest movement or miss/delay of medication. Wertli et al. (2014) noted that the researchers whose studies were included in the review consistently noted an increase in depressive thought patterns

before pain became chronic. This lends credibility to the idea that working with individuals with pain before their pain conviction beliefs develop may maximize functioning and psychological outcomes (Wertli et al., 2014).

Overlap of psychological barriers, such as catastrophizing and pain fear avoidance (kinesiophobia), is identified when assessing pain through the fear of generalization response (Karran et al., 2017; Linton & Shaw, 2011; Main et al., 2010; Wertli et al., 2014). In other words, there may be overlapping biological, social, and psychological factors to consider when transitioning to chronic pain conditions. Psychological constructs such as learning, perception, and attention, may influence this transition process (Nicholas, 2018). Pain catastrophizing and avoidance have been demonstrated to be predictors of poor potential recovery outcomes. Expectations of poor recovery and distress-related emotions influenced actions and emotional impact (Besen et al., 2017). Proactively addressing psychological and behavioral barriers in the acute stages may increase the potential for positive outcomes (Wertli et al., 2014). Identifying potential individual barriers to care may help healthcare providers strategize patient-centered treatment (Karran et al., 2017).

Linton et al. (2018) focused on the paradox of why coping strategies that were helpful in the short term continued to be used even when they maintained the problem in the long term. To summarize current knowledge, Linton et al. described four tenets that elucidated the etiology of chronic pain. These tenets emphasized that chronic pain disability was a developmental process over time, contextual factors set the stage for this

development, underlying transdiagnostic psychological factors fuel this development, and the principles of learning steer the development of pain behaviors (Linton et al., 2018).

De Baets et al. (2019) systematically reviewed 23 studies examining the role of cognitive, emotional, and behavioral influences on disability and pain. The authors focused on the association between pain catastrophizing and disability. Bundling intervention approaches such as medication management and psychological treatments assisted in the mitigation of chronic pain in musculoskeletal disorders (Ang et al., 2010). Kinesiophobia (fear of movement) is a predictor of significant disability, especially when preexisting depression is accounted for (Ang et al., 2010; Ploumis & Gkiatas, 2019). Researchers de Rooij et al. (2013) discussed how in patients with fibromyalgia, those who began their treatment study self-identifying with higher depression levels had poorer outcomes and higher pain interference than those self-reporting with lower levels of depression. The authors concluded that psychological barriers such as treatment expectations and self-efficacy predicted pain and disability perceptions in patients receiving physiotherapy. Stacy and Rosenheck (2019) noted that individuals with high exposure to positive values regarding recovery could embrace the conscious thought of recovery by becoming active participants, thereby enhancing their outcome. Moving into this space allows the individual creativity, freedom, control, and satisfaction, in their pain perception. The impact of the positive relationship with their treating clinicians, social supports, and other parties helps to promote recovery. The degree to which psychosocial factors influence chronic pain treatment outcomes is not as well understood, as their role

in acute pain recovery, and the timing of treatment itself may be an important gap that may be tied to psychological variables (Dures et al., 2016).

Yamada et al. (2019) used an ordinal logistic regression model to assess whether pain sensitivity mediated the association between smoking and pain-related occupational disability. The adjusted variables the authors used were demographic, socioeconomic status, work-related psychosocial factors, general psychological factors, and pain duration. Yamada et al. reported that smoking and pain were associated with pain-related occupational disability, mediated partially through greater pain intensity, in Japanese workers. Linton et al. (2018) suggested that understanding the psychological processes underlying the etiology of chronic pain provided testable ideas and a path forward for improving treatment interventions.

Continued research on psychological predictors of pain has implications for individuals and societal conceptions of disability (Arnstein, 2000; Vanichkachorn et al., 2014). Psychological factors play a significant role in conceptualizing pain and disability (Carriere, 2017; Carriere et al., 2015; Edwards et al., 2016). Research on these factors needs to continue to develop understanding of how they could be used to guide effective treatment and participation in that treatment. The experience of pain may be influenced by underlying psychological factors that researchers have yet to understand fully, such as pain catastrophizing (Linton et al., 2018).

Non-psychological Predictors of Pain Outcome

Predicting the response to chronic pain treatment is complicated, with multiple potential predictors. Some researchers have speculated that cultural beliefs about health

and illness may affect the effectiveness of chronic pain treatment (Brady et al., 2016; Portenoy et al., 2004; Xu et al., 2016). For example, patients from non-Western backgrounds may be more responsive to holistic models (e.g., biopsychosocial) of pain management that incorporate psychological and social factors into the treatment approach (Xu et al., 2016). Conversely, individuals from Western backgrounds may respond more effectively to more biomedically based practice that relies on treatment and increasing efficiency of pain management (Murphy et al., 2017). Irrespective of cultural background, interdisciplinary care is optimal from a healthcare standpoint for reducing treatment costs and increasing pain management efficiency (Jaksch et al., 2014).

The perception of pain is susceptible to a placebo or nocebo response, indicating that expectation plays an important role in the outcome. For example, the experience of pain can be influenced by expectations of pain discussed during informed consent procedures (Gligorov, 2018). During this process, physicians may have the best intentions but also contribute to an iatrogenic exacerbation of pain symptomology by inadvertently manipulating expectations (Gussak, 2018). The influence of the placebo response can also be seen when physicians focus on positive expectations for recovery (Bishop et al., 2019). The placebo response can be utilized in how providers speak to their patients about their condition and expectations for recovery (Castelnuovo et al., 2018).

Age, Sex, and Education in Pain Outcome

Socioeconomic status (SES) is a complex variable that can be determined using education level, income, and occupation. Winkleby et al. (1992) examined the

independent contribution of the variables of education, income, and occupation to cardiovascular disease risk factors and found that lower levels of education were the best demographic predictor of disease risk (Wang & Geng, 2019; Winkleby et al., 1992). Education level was used in the study as a proxy measure for SES, as it has demonstrated predictive value and has been used as a key measure of SES by the National Committee on Vital and Health Statistics in the U.S. (National Committee on Vital and Health Statistics, 2021).

Poleshuck and Green (2008) summarized the literature on the relationships between socioeconomic disadvantage (SED) and chronic disease and concluded that an improved understanding of how chronic disease and SED were related could lead to improved treatment for individuals with SED and pain. Bonathan et al. (2013) also reviewed the relationship between SES and chronic pain; the findings indicated that SES factors, such as lower levels of education, low income, and unemployment, were associated with higher rates of chronic pain. Bonathan et al. (2013) further highlighted that chronic or persistent pain was related to loss of work and reduced work effectiveness; disability, rather than chronic pain itself, was associated with SED.

Regarding age and sex differences in pain outcome, Shaygan et al. (2019) explored the relationship between pain intensity and disability in 279 patients suffering from chronic musculoskeletal pain in a German inpatient multidisciplinary short-term intensive pain treatment program. The authors found evidence that both age and sex produced an impact on the treatment of pain, with younger women demonstrating the largest improvements in pain intensity after treatment (Shaygan et al., 2019). Racine et al.

(2020) explored potential sex differences in the pretreatment measures and outcomes of 202 patients participating in an interdisciplinary pain treatment program and found that men reported higher levels of kinesiophobia, were more likely to view their pain as being harmful and used more activity pacing when doing daily activities than women at pretreatment. In contrast, women were more likely to engage in "overdoing" activity patterns than men (Racine et al., 2020). These researchers also found that women reported larger improvements in pain intensity and physical function compared to men at posttreatment, although both sexes reported similar reductions in depressive symptoms. Rovner et al.'s (2017) research also identified sex differences in a sample of 1,371 men and women entering a pain clinic program. The authors found that when both sexes experienced the same pain severity, women exhibited significantly higher activity levels, pain acceptance, and social support (Rovner et al., 2017; Solé et al., 2020).

The research of Poleshuck and Green (2008), Bonathan et al. (2013), Rovner et al. (2017), and Racine et al. (2020) indicated the potential importance of taking demographic variables such as SES, age, and sex into account as possible predictors of patient outcomes. There is some conflicting data among these studies. For example, Poleshuck and Green found that SED was a significant predictor of risk for chronic disease, but age and sex were not predictors. Shaygan et al. (2019) and Racine et al. both identified that age and sex played a role in pain outcomes. Rovner et al. reported that women suffering from chronic pain tended to have higher activity levels and pain acceptance than men with chronic pain when pain severity was controlled.

Similarly, Racine et al. found that women benefitted more from the interdisciplinary pain management program than men. Given these findings, age, sex, and SES, need to be considered as potential predictor variables along with treatment timing to control for potential confounding effects. Such research might enrich the literature, and the findings of this study could benefit scholars and practitioners in pain management.

Summary

As evidence continues to accumulate regarding how psychological mediators and moderators influence treatment response, professional organizations can update their guidance and ensure they deliver the most appropriate, efficient, and needs-based pain management models (ACPA, 2021; Shaw et al., 2017). Response to chronic pain treatment is complicated, with multiple possible psychological predictors of outcome. Multidisciplinary short-term intensive pain treatment programs may be the most effective treatments for chronic pain due to the diversity of treatment approaches these programs contain to address both physical and emotional issues. Age, sex, education at pretreatment, and pretreatment pain levels significantly predict patient outcomes (Racine et al., 2020; Shaygan et al., 2019); however, limited research exists in this area. Early admissions to these programs allow for the earlier introduction of coping techniques/skills before depression, pain catastrophizing, and reduced functioning develop into chronic issues. A comprehensive literature review revealed that few studies have been conducted to examine the association between treatment timing and chronic pain outcome, particularly for work injuries. In order to address this gap in the literature, I aimed to determine if entrance timing, age, sex, education, level of occupational

disability at pretreatment, and pretreatment pain levels were related to pain and disability outcomes in patients with chronic pain within a multidisciplinary short-term intensive pain treatment framework. This gap in the research lead to the rationale and justification for the current study.

The study could address an important gap in the literature and contribute to the scholarship, especially regarding treatment timing. This study could help foster positive treatment outcome scenarios for all stakeholders (Cancelliere et al., 2016). Suppose entrance timing was related to multidisciplinary short-term intensive pain treatment program outcomes. In that case, the findings may inform treatment planning for individuals suffering from chronic pain. The findings from this study could also significantly impact individuals, their families, healthcare providers, and society in general. Knowledge gained from this study may assist in developing appropriate treatment regimens that guide optimal entrance timing in accordance with relevant psychological factors and processes that influence rehabilitative outcomes. Results from this study may also lead to more informed and effective treatment decisions that can reduce sick leave and disability while increasing patient functioning.

Chapter 3: Research Method

The purpose of this nonexperimental quantitative study was to examine the extent to which the treatment outcomes for injured workers with chronic pain admitted into any of three different multidisciplinary short-term intensive pain treatment programs were related to the timing of entrance to the program. I investigated whether entrance timing, age, sex, education level, and pretreatment levels of pain and occupational disability predict posttreatment levels of pain and occupational disability in this population. In Chapter 3, I discuss the rationale for the study design and the methodology used in this research. I also discuss the sample size, sampling strategy, recruitment strategy, data collection, data analysis procedures, procedures to address ethical standards, and potential threats to validity.

The data for this study came from three programs providing 3 to 4 weeks of structured intensive pain management as an alternative to chronic medication usage. This treatment program includes physical therapy, occupational therapy, physical medicine, rehabilitation (medication tapering and adjustment to alternate medications), and psychological interventions including education, coping skills training, biofeedback, talk therapy, and relaxation training. The information gained from this current study may help patients and health care providers make informed choices about when individuals would benefit most from starting treatment.

Research Design and Rationale

This study was a nonexperimental quantitative study drawing upon de-identified archived data from three existing multidisciplinary short-term intensive pain treatment

programs in the Pacific Northwest. Quantitative researchers generate empirically strong conclusions by using streamlined instruments to examine data through statistical analysis (Bryman, 2016). Quantitative data are feasible to collect from large populations, making quantitative methodology the preferred approach when such instrumentation and large study populations are available (Bryman, 2016). Furthermore, quantitative research is appropriate when the problem and variables of interest align with the existing theory that can be used to guide the study. These considerations applied to the current study. The research questions pertained to the nature of the relationship between variables that could be quantified by research instruments used by the multidisciplinary short-term intensive pain treatment programs that supplied the data for this study. Choice theory (W. Glasser, 1998) was an appropriate theoretical framework addressing the study variables by informing the research questions and hypotheses to be tested.

The independent predictor variables were entrance timing, age, sex, education level, pretreatment level of pain, and pretreatment occupational disability. The dependent variables were posttreatment occupational disability and pain levels. An advantage of using the nonexperimental format is to investigate constructs as they exist (Larsen et al., 2021). The goal is to interpret, examine, and make conclusions based on the findings to predict outcomes based on different variables.

Existing research regarding multidisciplinary short-term intensive pain treatment programs had included both quantitative and qualitative approaches to examine treatment outcomes (Burke et al., 2017; Colletti et al., 2019; Giusti et al., 2017; Giusti et al., 2020; Liu et al., 2020; Maeng et al., 2018; Penney & Haro, 2019). Qualitative researchers

focused on care utilization, cost, opioid administration, and effective teaching strategies. No published studies had examined the relationship between entrance timing and outcome for this program model. A nonexperimental quantitative design with archival data was used to answer the research questions because a large amount of data was available and the dependent variables of interest were quantifiable.

Methodology

Population

The population of interest was adults with chronic pain who participated in any of three different multidisciplinary short-term intensive pain treatment programs at facilities that provided similar treatment in the Pacific Northwest between 2012 and 2019. The population was limited to those who participated in treatment up to 7 years after their injury. This delimitation ensured that the participants had relevant injuries sustained recently enough for their data to contribute meaningfully to the study. Men and women age 18 to 60 years of any education level and with varying levels of occupational disability and pain levels who were enrolled in the treatment program between 2012 and 2019 no more than 7 years after injury constituted the population that was sampled for the study.

Participants

The sampling for the study consisted of data from the archival records of three multidisciplinary short-term intensive pain treatment programs located in the Pacific Northwest between 2012 and 2019 after the pool of potential participants was identified using the inclusion criteria. The available sample size in the current databases was

estimated to be around 500 potential participants. I conducted a power analysis using G*Power 3.1 software to determine the appropriate sample size for this study (see Faul et al., 2009). The study included a planned multivariate linear regression with $p = 0.05$, a medium effect size ($f^2 = 0.15$), and a power of 0.80, requiring a sample size of 159. Six predictor variables were used, including age, sex, education level, pretreatment pain level, pretreatment disability level, and entrance timing. All archival data were de-identified before I accessed the database.

Procedures for Recruitment, Participation, and Data Collection

Archival records were collected from three multidisciplinary short-term intensive pain treatment programs treating patients in the Pacific Northwest. The pre- and postassessments used as data for this current study were collected during the clinic intake, discharge, and follow-up evaluations. The collected data were de-identified by trained staff and were provided to me as part of a data use agreement. Demographic information was included and used as predictive independent variables; however, no identifying information was included. Information was obtained via electronic format.

Instrumentation and Variable Operationalization

Demographic Information

Demographic information was collected, including age, sex, education level, and entrance timing. Entrance timing, age, sex, education level, pretreatment level of pain, and pretreatment occupational disability were used as predictor variables.

Occupational Disability Level

Occupational disability level was assessed by a physical examination at the time of entrance (pretreatment) and again at discharge (posttreatment). Disability was scored as a ranked ordinal variable with the categories of sedentary, light, medium, heavy, and very heavy per the Dictionary of Occupational Titles (U.S. Department of Labor, 1991). The Dictionary of Occupational Titles is a standard in the United States for occupational information outlining occupations defined by complexity dimensions (Hawkins, 2016).

Time of Treatment Entry

The time of treatment entry was calculated as the difference between the initial injury date and the program entrance date, measured in months.

Pain Level

Pain level was measured as an ordinal variable based on participants' self-related pain scoring. These scores range from 1 to 10, with 1 indicating *slight pain* and 10 indicating *the worst possible pain*. The average pain level was assessed at pretreatment and posttreatment.

Data Analysis Plan

RQ1: What is the combined effect of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance in accounting for variance in posttreatment and disability levels?

H_o1: The combined effect of the proportion of variance explained by a set of predictor variables in accounting for the posttreatment variables is zero.

H_a1: The combined effect of the proportion of variance explained by a set of predictor variables in accounting for the posttreatment variables is greater than zero.

RQ2: What are the relative effects of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance in accounting for variance in posttreatment pain and disability levels?

H_o2: The relative effects of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance account for no variance in posttreatment pain and disability levels.

H_a2: The relative effects of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance account for significant variance in posttreatment pain and disability levels.

Multivariate linear regression analysis was used to determine whether there was a predictive relationship between the independent variables (age, sex, education level, pretreatment occupational disability, pretreatment pain level, and entrance timing) and the dependent variables (posttreatment occupational disability and pain levels). A multivariable linear regression was also used to determine the relative importance of each predictor variable according to the standardized regression coefficients, with larger magnitudes indicating greater contribution to the prediction of the dependent variable.

Testing

Statistical Package for the Social Sciences (SPSS) software was used to perform a multivariate linear regression analysis. The archival data were securely transmitted

electronically with password protection through a secured virtual private network in Excel format. This information was imported into the SPSS program. I used the general linear model to assess the predictive relationship between the independent variables and two dependent variables. Therefore, multivariate multiple regression was the most appropriate analysis to test the hypotheses.

Assumptions

Multivariate linear regression assumes (a) the dependent variable can be measured on a continuous scale, (b) there are a minimum of two independent variables that can be measured either as a continuous or categorically, (c) linearity between the dependent and independent variables, (d) no significant outliers, (e) homoscedasticity, and (f) normality (Laerd Statistics, 2018). Assumptions A and B were met through scatterplot review. Linearity and normality were addressed through SPSS testing and scatterplotting. Homoscedasticity was addressed during visual observation of the plotting compared to unstandardized predicted values. Outliers were identified on the scatterplot and eliminated (Room, 2020). Regression was robust to violations of the normality assumption, especially with large sample sizes; however, a nonlinear transformation conducted on this data was appropriate.

Threats to Validity

I obtained data from three multidisciplinary short-term intensive pain treatment programs in the Pacific Northwest, which may limit the generalizability of results beyond this geographical area. Using archival data did not allow examination of participant perceptions and experiences before, during, or after program participation. Bias was

minimized because I was not present when the data were collected. The fact that the data were self-reported represented one threat to validity, but there was no better way of measuring subjective patient outcomes such as pain. Another potential threat to validity was inaccurate reporting of these data in the archival records.

Internal validity refers to the soundness of the findings in a study. Specifically, internal validity refers to how well a piece of evidence supports a cause-and-effect assertion in the context of a study. However, this study was nonexperimental, which meant any claims regarding a cause-and-effect relationship were not possible. Testing and interpreting the results from hypotheses testing can involve threats to the validity of interpretation for quantitative researchers. Quantitative research may involve rejecting null hypotheses or failing to reject null hypotheses (Martin & Bridgmon, 2012).

Threats to conclusive findings occur when quantitative researchers encounter a Type I error, which involves rejecting a valid null hypothesis (Ibrahim et al., 2013). In the current study, internal validity was strengthened by controlling for potentially confounding variables such as demographic status, which may have impacted the outcome independently of pain assessment scores. The data collection and analysis processes are reported in Chapter 4.

Ethical Procedures

Three multidisciplinary short-term intensive pain treatment programs in the Pacific Northwest agreed to participate and provided a data use agreement. No information was gathered until permission was granted from the Walden University Institutional Review Board 04-26-0599180. All data were de-identified by the

multidisciplinary short-term intensive pain treatment program prior to transmission to ensure the confidentiality of the data. No names or identifying information were included in the data; thus, ethical risks were minimal. The database information will remain password protected on my personal computer until 7 years after publication. All data were maintained electronically; no paper copies were provided.

Summary

This chapter included the research questions, hypotheses, data collection, measurements, and data analysis plan. I used a quantitative approach to examine the predictive relationship between age, sex, education level, pretreatment pain level, pretreatment disability level, and entrance timing (independent variables) and posttreatment pain and disability levels (dependent variables). The methodology that was used was a nonexperimental quantitative design. I used multivariate linear regression analysis to examine possible predictive relationships between the independent and dependent variables. This was accomplished using archived data from three multidisciplinary short-term intensive pain treatment programs.

Chapter 4: Results

The purpose of the quantitative nonexperimental study was to use archival data to examine whether the timing of entry into three similar multidisciplinary short-term intensive pain treatment programs, as well as demographic and pretreatment pain and disability, predicted pain and functioning levels at posttreatment. Researchers had found that age, sex, education level, and pretreatment pain levels may be significant predictors of patient outcomes; however, it was unknown whether the pain and disability of individuals who participate in multidisciplinary short-term intensive pain treatment can be predicted by the postinjury timing of their entrance to treatment. Multiple regression was used in order to address the following research questions and hypotheses:

RQ1: What is the combined effect of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance in accounting for variance in posttreatment and disability levels?

H_o1: The combined effect of the proportion of variance explained by a set of predictor variables in accounting for the posttreatment variables is zero.

H_a1: The combined effect of the proportion of variance explained by a set of predictor variables in accounting for the posttreatment variables is greater than zero.

RQ2: What are the relative effects of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance in accounting for variance in posttreatment pain and disability levels?

H_o2: The relative effects of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance account for no variance in posttreatment pain and disability levels.

H_a2: The relative effects of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance account for significant variance in posttreatment pain and disability levels.

This chapter contains a discussion of the study's population and sample as well as a demographic description of the sample. Demographic descriptions are included along with frequencies and percentages for categorical (nominal) variables and means and standard deviations measured at the interval level of measurement. I also present the testing of parametric assumptions for the statistical analysis and the results of statistical hypothesis testing. This chapter concludes with a discussion of the results of this study.

Data Collection

The data for this study were obtained from three independent multidisciplinary short-term intensive pain treatment programs in the Pacific Northwest. The population of interest for this study included adults with chronic pain who participated in any of three different multidisciplinary short-term intensive pain treatment programs in the Pacific Northwest between the years 2012 and 2019. The population was limited to those who participated in treatment up to 7 years after their injury. This delimitation ensured that the participants had relevant injuries that had been sustained recently enough for their data to contribute meaningfully to the study. The available relevant sample size in the current database was expected to be approximately 500 potential cases.

I originally contacted four multidisciplinary short-term intensive pain treatment programs in the Pacific Northwest who provided verbal agreements for participation in this data collection process. Emails were submitted to each location with a formal request, and formal agreements of participation were signed and collected. A spreadsheet was submitted to each facility with the requested information. Three of the four facilities returned the requested spreadsheet. Location 4 stated that this request would need to be reviewed by their institutional review board and that it would take several additional months to obtain this approval. Because the number of datapoints identified in the power analysis was met, I determined that this study would move forward without the fourth facility. The request for information was extended by one month to allow the facilities to gather and input the information into the spreadsheet. In total, 439 cases were provided. Due to incomplete information, 101 cases were excluded; 39 were excluded due to missing information, and 62 did not meet the inclusion criteria. This left a total of 338 cases for the analysis. The sample size exceeded the calculated required sample size for analysis, which was 159 cases.

The sample was examined to determine whether there were differences between the sites in regard to the variables using analysis of variance or chi-square tests. There was no significant mean difference in age between three site locations ($p = .186$), and no sex distribution differences between the three sites ($p = .151$). Results of analysis of variance indicated that there were significant mean differences in pretreatment pain and disability levels between the three sites ($p < .001$). Regarding disability level, Site 1 had mean disability levels ($M = 3.27$, SD = 1.00) significantly greater than Site 2 ($M = 2.50$,

SD = 1.47) and Site 3 (*M* = 2.84, *SD* = 0.85). No other differences were significant. Regarding pain levels, Site 1 had a mean pain level (*M* = 6.48, *SD* = 1.63) significantly greater than Site 2 (*M* = 5.85, *SD* = 1.95) and Site 3 (*M* = 4.06, *SD* = 1.11). Additionally, the Site 3 mean pain level was significantly less than Site 2 or 1. There were, however, no site differences in posttreatment disability level ($p = .282$). The data set consisted of the independent predictor variables of entrance timing of the program (measured in months), age, sex, education level, pretreatment level of pain, and pretreatment occupational disability as well as the dependent variables of posttreatment occupational disability and pain levels.

Results

Demographic Predictor Variables of Sex, Age, and Education Level

Of the 338 participants, 226 were men and 112 were women. The mean age was 44.63 years. The largest education level in the sample was those who had less than a general equivalency diploma (GED; 49.1%), and 12.8% of the sample had at least some college (see Table 1).

Table 1

Demographics

Variable	Category	*n*	%	*M*	*SD*	Range
Sex	Male	226	66.9			
	Female	112	33.1			
	Total	338	100			
Age				44.63	9.23	22–65
Education level	Less than GED	166	49.1			
	GED	25	7.4			
	High school diploma	83	24.6			
	Vocational/certificate	21	6.2			
	Some college	32	9.5			
	Four-year degree or more	11	3.3			
	Total	338				

Note. Percentages may not add to 100 due to rounding.

Variables of Entrance Timing, Pain, and Occupational Disability

The mean number of months after injury before entering the treatment program was 28.85 (*SD* = 18.92). The mean pretreatment level of pain (measured on a scale from 1 to 10 with increasing values indicating greater pain) was 5.80 (*SD* = 1.89). Posttreatment pain levels ranged from 0 to 10 with a mean of *M* = 5.18 (*SD* = 2.03). Occupational disability was measured on an ordinal scale from 0 (*not working*) to 5 (*very heavy*). At pretreatment, the largest group in the sample rated at the medium level (40.8%), while at posttreatment, most participants were categorized at the light level (46.7%). Details are provided in Table 2.

Table 2

Descriptive Statistics for Pre- and Posttreatment Pain Levels, Program Occupational Disability Levels, and Entrance Timing into Program

Variable	Min	Max	*M*	*SD*
Pretreatment pain level	1	10	5.80	1.89
Posttreatment pain level	0	10	5.18	2.04
Entrance timing in months	2.57	80.60	28.85	18.92
Pretreatment occupational disability level	*f*	%		
Not working	15	4.4		
Sedentary	38	11.2		
Light	39	11.5		
Medium	138	40.8		
Heavy	85	25.1		
Very heavy	23	6.8		
Postprogram occupational disability	*f*	%		
Not working	7	2.1		
Sedentary	62	18.3		
Light	158	46.7		
Medium	87	25.7		
Heavy	24	7.1		
Very heavy	0	0		

Testing the Assumptions of the Regression Analysis

Bivariate correlations were conducted to assess the univariate relationships between the independent and dependent variables. This was performed to assess preliminary associations prior to running multiple regression. The variables were approximately normally distributed as assessed by skewness and kurtosis values within -3 to +3 (see Field, 2018). Additionally, there were no standardized values outside -3 to +3, indicating no outliers (see Field, 2018). Regarding the dependent variable posttreatment occupational disability, there were significant associations with sex ($p < .001$), education ($p < .003$I), and pretreatment disability level ($p < .001$). Being female was associated

with lower levels of posttreatment disability level, increased education was associated with increased levels of posttreatment disability level, and pretreatment disability level was associated with increased posttreatment disability level (see Table 3.)

Table 3

Pearson Correlations Between Posttreatment Disability Level, Entrance Timing, Age, Sex, Education Level, Pretreatment Pain Level, and Pretreatment Disability Level

Category	1	2	3	4	5	6	7
Posttreatment disability level	1						
Entrance timing	-.048	1					
Age	.020	.115	1				
Sex	-.232*	-.046	.055	1			
Education	.161*	.016	.001	-.598	1		
Pretreatment pain level	-.067	.175	-.011	.059	-.119	1	
Pretreatment disability level	.345*	.047	-.063	.307*	.197*	-.007	1

* Significant at the .01 level.

Regarding the dependent variable postpain level, there were significant associations with entrance timing (r = .165, p = .002), education (r = -.171, p = .002), and pretreatment pain level (r = .574, p < .001). Increased entrance timing and prepain level were associated with increased postpain levels. Increased education was associated with decreased posttreatment pain levels (see Table 4).

Table 4

Pearson Correlations Between Postpain Level, Entrance Timing, Age, Sex, Education Level, Pretreatment Pain Level, and Pretreatment Disability Level

Category	1	2	3	4	5	6	7
Posttreatment pain level	1						
Entrance timing	.165*	1					
Age	.044	.115	1				
Sex	.086	-.046	.055	1			
Education	-.171*	.016	.001	-.598	1		
Pretreatment pain level	.574*	.175	-.011	.059	-.119	1	
Pretreatment disability level	-.009	.047	-.063	.307	.197	-.007	1

* Significant at the .01 level.

Testing of Parametric Assumptions Required for Multiple Regression

Multiple regression was run to predict posttreatment occupational disability and postpain level from entrance timing, age, sex, education level, pretreatment level of pain, and pretreatment occupational disability. There was linearity and homoscedasticity as assessed by plots of standardized residuals against the predicted values (see Figures 1 and 2).

Figure 1

Scatterplot of Standardized Residuals Against the Predicted Values (DV: Posttreatment Occupational Disability Level)

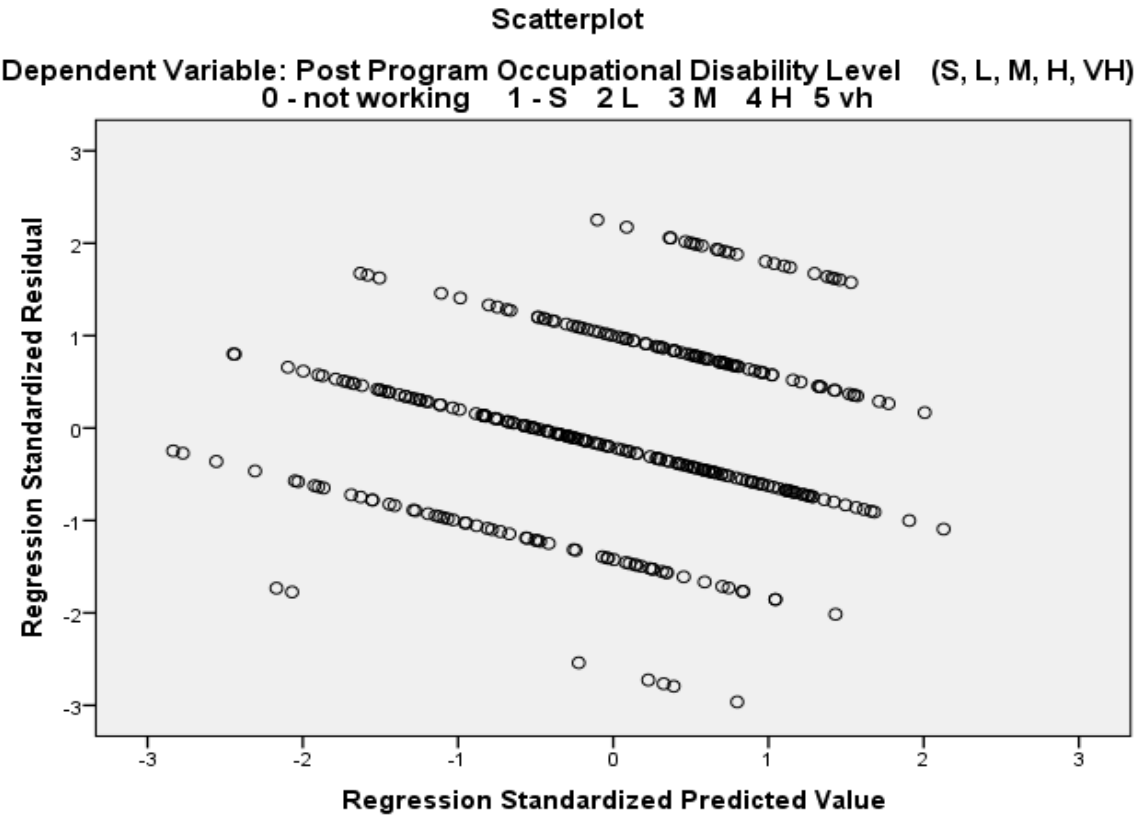
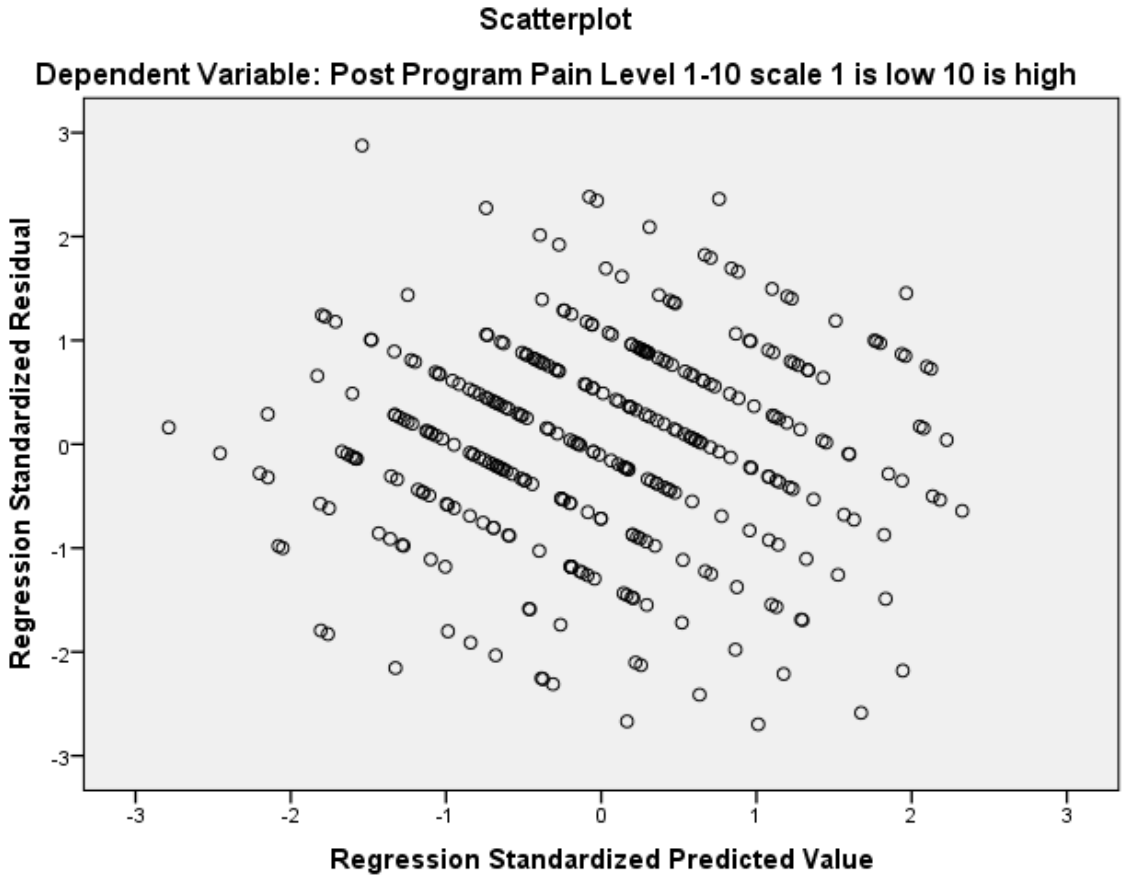


Figure 2

Scatterplot of Standardized Residuals Against the Predicted Values (DV: Posttreatment Pain Level)



There was independence of residuals as assessed by a Dubrin-Watson statistic of 2.116. There was no evidence of multicollinearity as assessed by variance inflation factors less than 10. There were no standardized residuals greater than ±3 standard deviations, indicating no outliers. The assumption of normality was met as assessed by visual inspection of histograms (see Figures 3 and 4).

Figure 3

Histogram of Regression Residuals (DV: Posttreatment Occupational Disability Level)

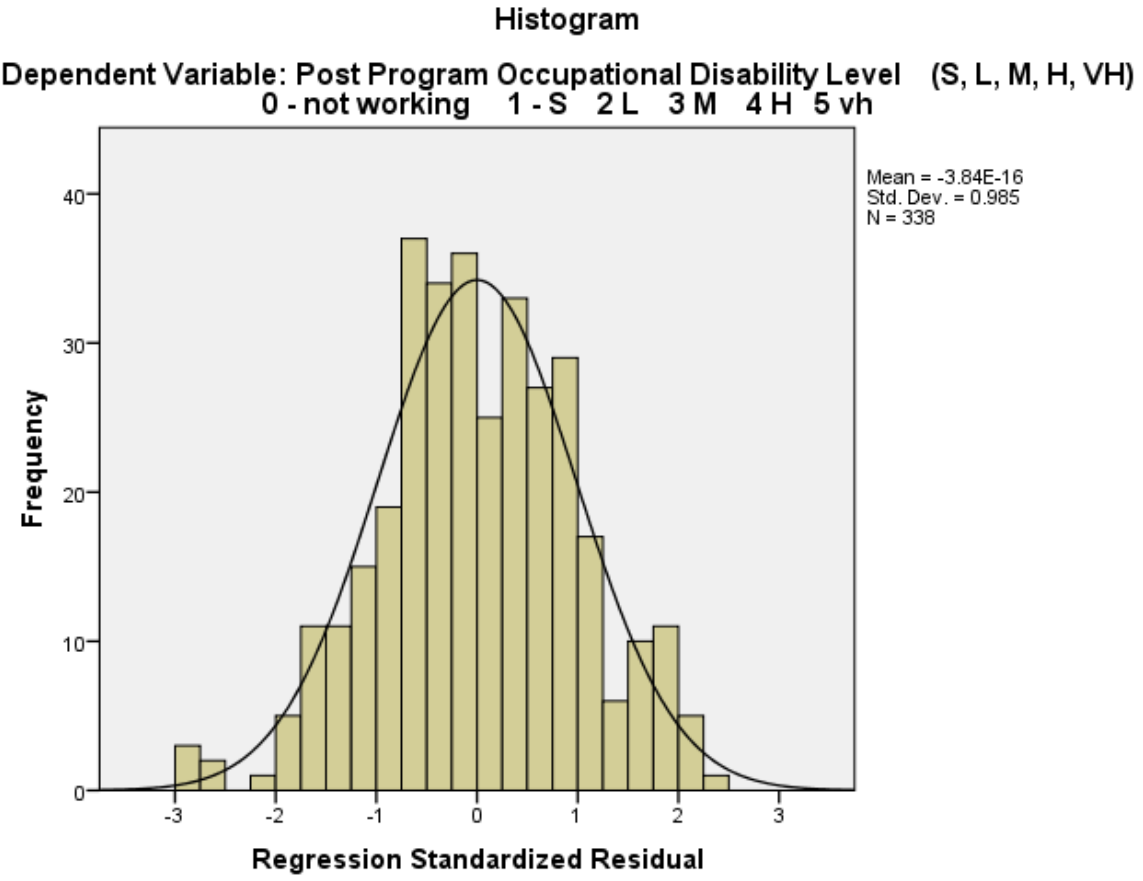
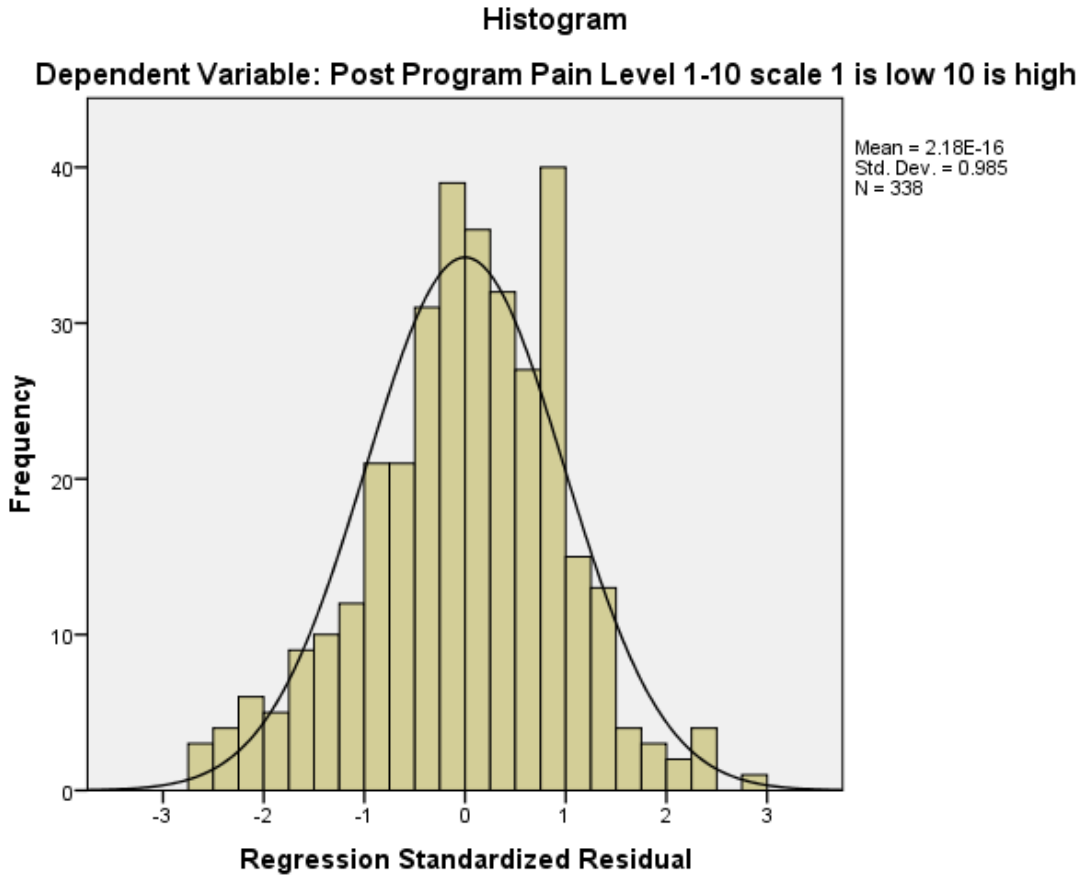


Figure 4

Histogram of Regression Residuals (DV: Postpain Level)



Hypothesis Testing

Multiple regression was performed with SPSS in order to address this first research question and hypothesis:

RQ1: What is the combined effect of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance in accounting for variance in posttreatment and disability levels?

H_o1: The combined effect of the proportion of variance explained by a set of predictor variables in accounting for the posttreatment variables is zero.

H_a1: The combined effect of the proportion of variance explained by a set of predictor variables in accounting for the posttreatment variables is greater than zero.

In order to control the effects of pretreatment pain and disability levels, hierarchical multiple regression was conducted with SPSS. The controlled variables of pretreatment pain and disability levels were entered into the first model. Next, the independent variables of age, sex, education level, and time of entrance were entered to create the second model. Education level was a nominal variable with six categories (Less than a GED, GED, HSDP, Vocational, Some College, and at least a BS/BA). In order to conduct the regression analysis, this variable had to be converted into five categories with "Less than a GED" serving as reference category.

Regarding the dependent variable of posttreatment occupational disability level, after controlling for pretreatment pain and disability levels, the overall model was not found to be statistically significant (F[8, 327] = 1.316, p - .234). The model explained 15.0% of the variance in predicting posttreatment occupational disability level from the variables of entrance timing, age, sex, and education level, while controlling for the effects of pretreatment level of pain, and pretreatment occupational disability (R^2 = .150; see Table 5).

Table 5

F Test Results for RQ1 (DV: Postprogram Occupational Disability Level)

Model*	*R*	*R* square	Adjusted *R* square	Std. error of the estimate	Change Statistics				
					R square change	*F* change	*df*1	*df*2	Sig. *F* Change
1	.351[a]	.123	.118	.82926	.123	23.505	2	335	.000
2	.388[b]	.150	.124	.82615	.027	1.316	8	327	.234

*Model 1 predictors: Pretreatment pain, Pretreatment disability levels.

Model 2 predictors: Pretreatment pain, Pretreatment disability levels, Age, Sex, Educational level, Time of entrance.

Regarding the dependent variable of postpain level, after controlling for pretreatment pain and disability levels, the overall model was significant (F[2, 327] = 2.539, p = .011). The model explained 36.9% of the variance in predicting postpain level from the variables of entrance timing, age, sex, and education level, after controlling for pretreatment level of pain and pretreatment level of pain, and pretreatment occupational disability (R^2 = .369; See Table 6). Thus, this first null hypothesis was rejected.

Table 6

F Test Results for RQ1 (DV: Postpain Level)

Model	*R*	*R* square	Adjusted *R* square	Std. error of the estimate	Change Statistics				
					R square change	*F* change	*df*1	*df*2	Sig. *F* change
1	.574[a]	.329	.325	1.67288	.329	82.273	2	335	.000
2	.607[b]	.369	.349	1.64297	.039	2.539	8	327	.011

*Model 1 predictors: Pretreatment pain, Pretreatment disability levels.

Model 2 predictors: Pretreatment pain, Pretreatment disability levels, Age, Sex, Educational level, Time of entrance.

Hierarchical multiple regression was conducted with SPSS in order to address the following second research question and hypotheses:

RQ2: What are the relative effects of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance in accounting for variance in posttreatment pain and disability levels?

H_o2: The relative effects of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance account for no variance in posttreatment pain and disability levels.

H_a2: The relative effects of pretreatment pain, occupational disability level, age, sex, education level, and time of entrance account for significant variance in posttreatment pain and disability levels.

Regarding the dependent variable of postprogram occupational disability level, after controlling for the effects of pretreatment pain and disability levels, no significant predictors were found. Age (B = 0.005, p = .307), sex (B = -.0.214, p = .124), education

level ($p > .05$), and time of entrance ($B = -0.003$, $p = .226$) were not significant; thus, I failed to reject the null hypothesis. Table 7 provides this information.

Table 7

Regression Coefficient Table for RQ2 (DV: Postprogram Occupational Disability Level)

Model		Unstandardized coefficients		Standardized coefficients	*t*	*p*	Collinearity statistics	
		B	*SE*	*β*			Tolerance	VIF
1	(Constant)	1.621	.182		8.904	.000		
	Pretreatment occupational disability level	.250	.037	.344	6.732	.000	1.000	1.000
	Pretreatment pain level	-.030	.024	-.064	-1.253	.211	1.000	1.000
2	(Constant)	1.535	.311		4.929	.000		
	Pretreatment occupational disability level	.228	.039	.315	5.809	.000	.886	1.129
	Pretreatment pain level	-.021	.025	-.046	-.857	.392	.907	1.103
	Age	.005	.005	.053	1.024	.307	.966	1.035
	Sex	-.214	.139	-.114	-1.542	.124	.475	2.106
	GED	-.027	.200	-.008	-.133	.894	.738	1.356
	HSDP	.117	.144	.057	.815	.415	.527	1.898
	Vocational	.083	.214	.023	.387	.699	.760	1.316
	Some college	-.060	.184	-.020	-.326	.745	.693	1.444
	At least a BS/BA	.133	.273	.027	.487	.627	.860	1.163
	Less than GED*							
	Entrance timing	-.003	.002	-.064	-1.212	.226	.931	1.075

*Reference category.

Regarding the dependent variable of posttreatment pain level, after controlling for the effects of pretreatment pain and disability levels, educational levels of GED (B = -.898, p = .025), high school diploma (B = -0.843, p = .003), and at least a BA/BS (B = -1.377, p = .012) were significant predictors of postpain level. Compared with those individuals with less than a GED education, there were decreased levels of posttreatment pain levels with increasing educational levels. Those with at least a BA/BS had the greatest decrease in postpain levels. Table 8 provides this information. Thus, the second null hypothesis was rejected.

Table 8

Regression Coefficient Table for RQ2 (DV: Postpain Level)

Model		Unstandardized coefficients		Standardized coefficients	*t*	*p*	Collinearity statistics	
		B	*SE*	*B*			Tolerance	VIF
1	(Constant)	1.617	.367		4.404	.000		
	Pretreatment occupational disability	-.009	.075	-.005	-.114	.909	1.000	1.000
	Pretreatment level	.618	.048	.574	12.826	.000	1.000	1.000
2	(Constant)	1.590	.619		2.568	.011		
	Pretreatment disability	.016	.078	.010	.208	.835	.886	1.129
	Pretreatment pain	.606	.050	.562	12.190	.000	.907	1.103
	Age	.008	.010	.036	.795	.427	.966	1.035
	Sex	-.314	.275	-.073	-1.141	.255	.475	2.106
	GED	-.898	.398	-.116	-2.258	.025	.738	1.356
	High school diploma	-.843	.286	-.179	-2.948	.003	.527	1.898
	Vocational	.025	.425	.003	.060	.953	.760	1.316
	Some college	-.663	.367	-.095	-1.809	.071	.693	1.444
	At least a BS/BA	-1.377	.543	-.120	-2.535	.012	.860	1.163
	Less than GED*							
	Entrance timing	.006	.005	.052	1.134	.257	.931	1.075

*Reference category

Summary

The purpose of the quantitative nonexperimental study was to use archival data to examine whether the timing of entry into any of three different multidisciplinary short-term intensive pain treatment programs, as well as demographic and pretreatment pain and disability, predicted pain and functioning levels at posttreatment. Multiple regression was used to assess the research questions. The combined effect of age, sex, education level, and time of entrance, while controlling for preprogram pain and disability levels,

was statistically significant in accounting for variance in posttreatment program pain and disability levels. The combined effect of the independent variables resulted in a significant predictive model for the second research question and not for the first research question.

Regarding the second research question, program occupational disability level was a significant predictor of posttreatment program occupational disability level. A one-unit increase in pretreatment program occupational disability level corresponds to an overall average increase in posttreatment program occupational disability level by 0.228. Regarding the dependent variable of posttreatment pain level, educational levels of GED, high school diploma, and at least a BA/BS, as well as pretreatment pain level, were significant predictors of posttreatment pain level. Compared with those individuals with less than a GED education, there were decreased levels of posttreatment pain levels with increasing educational levels. Those with at least a BA/BS had the greatest decrease in posttreatment pain levels. Lastly, an increase in pretreatment pain levels by one unit corresponded to an increase in posttreatment pain levels on an average by 0.606.

Chapter 5: Discussion, Conclusions, and Recommendations

The problem investigated in this study was the lack of knowledge regarding whether the pain and disability outcomes of individuals participating in multidisciplinary short-term intensive pain treatment could be predicted by the timing of their entrance into treatment. These programs are specific, comprehensive, and focused on short-term intensive treatment that spans 3 to 4 weeks and are designed for each patient's specific needs. Understanding whether the timing of entrance into such programs makes a difference in outcome may inform the decision-making process regarding treatment options and may lead to more effective treatment of individuals who suffer from chronic pain. The purpose of this quantitative nonexperimental study was to use archival data to examine whether the timing of entry into any of three multidisciplinary short-term intensive pain treatment programs predicted pain and functioning levels at posttreatment.

The predictive ability of the combination of age, sex, education level, and time of entrance, while controlling for preprogram pain and disability levels, was not statistically significant in accounting for variance in posttreatment disability levels but was significant in predicting posttreatment pain level. Entrance timing was not related to either posttreatment disability or pain. The only significant findings were that higher levels of education predicted lower posttreatment pain levels. Those with at least a bachelor's degree had the lowest posttreatment pain level. In addition, the higher the pretreatment occupational disability individuals in treatment experienced, the higher the posttreatment occupational disability level, a finding that is not surprising. This relationship between pretreatment and posttreatment occupational disability appears to

not be affected by age, sex, education level, or timing of treatment and entrance as a whole. This chapter presents the interpretation of findings, limitations of the study, recommendations for future research, implications of the study, and a summary of the chapter.

Interpretation of the Findings

After controlling for pretreatment pain and disability levels, I determined that the overall model to predict posttreatment disability was not statistically significant. The findings indicated that entrance timing, age, sex, and education level were not significant predictors of posttreatment occupational disability level after controlling for pretreatment level of pain and pretreatment occupational disability. These findings are inconsistent with the findings of Shaygan et al. (2019), who found that age and sex predicted the modulation of disability due to pain for individuals participating in multidisciplinary short-term intensive pain treatment. The only significant predictor of posttreatment disability level was pretreatment disability: Higher pretreatment disability scores were related to higher posttreatment disability scores.

The development of disability is a lengthy process involving contextual factors such as response to treatment, age, sex, and education levels of the participants (Linton et al., 2018). In contrast to current study findings, Rovner et al. (2017) established that when both sexes experienced the same pain severity, women exhibited significantly higher activity levels, pain acceptance, and social support than men. Racine et al. (2020) found that women reported larger improvements in pain intensity and physical function compared to men at posttreatment. Solé et al. (2020) also found that when both sexes

experienced the same pain severity, female patients exhibited significantly higher activity levels, pain acceptance, pain management, and social support. In the current study, sex did not predict posttreatment pain or disability.

Regarding predicting pain outcomes, entrance timing, which was the focus of this study, was not a significant predictor of posttreatment pain and disability levels. However, the results indicated that education level significantly predicted posttreatment pain levels. This is somewhat consistent with previous studies that age, sex, and education are significant predictors of pain outcomes (see Racine et al., 2020; Shaygan et al., 2019). Given those findings, Dueñas et al. (2016) called for more social and family-oriented approaches to understand the management of chronic pain and to address the complex factors that influence its expression, such as age, sex, and education level. Sex in particular has been found to be related to pain outcomes in previous research. My findings were not consistent with previous research regarding the relationship between sex and pain outcomes but support the conclusion that education levels should be considered in treatment planning.

Although the current study indicated that entrance timing, age, sex, and education level were not significant predictors of posttreatment occupational disability level after controlling for pretreatment levels of pain and pretreatment occupational disability, Hylands-White et al. (2017) suggested that patients with relatively low levels of education suffering from chronic pain must be given the tools with which their long-term pain can be managed to an acceptable level. Education about pain and pain management enables positive early interactions between the patient and their treating providers

because there tends to be a high level of medication adherence in patients with high education levels, which improves treatment outcomes (Castelnuovo & Schreurs, 2019).

However, after controlling for the effects of pretreatment pain and disability levels, education level was a significant predictor of posttreatment pain level in the current study. When compared with individuals with less than a GED education, posttreatment pain level decreased as education level increased. Those with at least a bachelor's degree had the greatest decrease in posttreatment pain level. The current study findings support previous literature by establishing that education level may be critical in determining rehabilitative success among patients with pain (see Shaw et al., 2017). The importance of the findings is that the treatment appears to only be effective in lowering pain levels for people with higher education levels, and as a result, the treatment may need to be changed to address the needs of individuals with lower education levels.

Education level is a key component of SES (National Committee on Vital Health and Statistics, 2021). Current findings concur with Poleshuck and Green (2008) who found that training and mentorship of individuals with lower education levels through multidisciplinary short-term intensive pain treatment programs could lead to improved treatment outcomes for individuals with socioeconomic disadvantage. Jonathan et al. (2013) indicated that low SES factors such as lower levels of education and low income were associated with high levels of chronic pain, possibly because individuals with lower SES also have more physical jobs that can lead to injury and chronic pain. Jonathan et al. reiterated that researchers need to find out how to serve those in lower SES to better meet their needs. Current findings imply that people with a higher level of education may

benefit from multidisciplinary short-term intensive pain treatment programs, but the programs may need to be adapted to meet the needs of those with lower education levels. Multidisciplinary short-term intensive pain treatment programs can be costly and need to be accessible to anyone who can benefit from them.

Consistent with the current study findings, previous researchers found that lower levels of education were the best demographic predictor of disease risk and treatment outcomes among patients with low SES (Wang & Geng, 2019; Winkleby et al., 1992). Current findings are somewhat consistent with other studies that demonstrated that the factors predicting positive treatment outcomes in multidisciplinary short-term intensive pain treatment include a higher level of education, higher SES, high self-efficacy, positive expectations, less severe injury or pain, and increased coordination of work with treatment among workers (Cancelliere et al., 2016; Kapoor et al., 2006).

Cancelliere et al. (2016) also identified education levels as the key predictor of posttreatment pain levels and disability. The current results add to the previous literature by establishing that education levels were a significant predictor of postpain levels in that patients with high school diplomas experienced higher postpain levels compared to patients with higher education levels, such as a college diploma.

Education level has been found in both current and previous research to significantly impact the extent to which patients with chronic pain benefit from treatment (Svanberg et al., 2017). Current study findings are consistent with results reported by Poleshuck and Green (2008) highlighting that education level has a significant impact on posttreatment pain levels. Although this study indicated a connection between

posttreatment pain levels and education levels, prior research demonstrated that earlier timed treatment may additionally increase treatment effectiveness (Müller et al., 2016).

People suffering from chronic pain have little to no choice in some of the demographic factors that may affect treatment outcomes, but they may have more choices regarding treatment decisions. Current findings indicated that entrance timing was not a significant predictor of posttreatment pain levels, and current study findings are consistent with previous research regarding the role of education level in the treatment outcomes of those who engage in a multidisciplinary short-term intensive pain treatment program (Higgins et al., 2015). This may mean that professionals who design these treatment programs need to consider developing a treatment that focuses on a broader demographic to benefit a diverse group of individuals. Patients with lower education levels may struggle to manage their pain effectively. However, providing these patients with practical adaptation skills as well as emotional coping skills can be helpful in addressing this issue (Higgins et al., 2015).

A multidisciplinary short-term intensive pain treatment approach to pain management addresses a range of factors that impact chronic pain, and treatment outcomes include aims such as return-to-work, pain flare coping plans, goal setting, and problem solving. In contrast, interventions that are delivered individually such as physical therapy may focus only on goals associated with that specific treatment modality. Individuals in multidisciplinary short-term intensive pain treatment programs are equipped to address psychological influences on pain management, such as self-efficacy and expectations about care outcomes. However, there is a great deal of

variability of outcomes in these programs. I. R. Wilson (2017) found that multidisciplinary short-term intensive pain treatment programs had a significant benefit on functioning for some patients but relatively little impact on treatment outcome in low SES individuals with low levels of education. Current findings are consistent with the previous literature establishing that reduction in pain following multidisciplinary short-term intensive pain treatment is often associated with higher education levels (Shaygan et al., 2019).

Although entrance timing was the variable of interest in the current study, it was not found to be a significant predictor of posttreatment pain levels and disability. Although the findings were not significant, there are important implications regarding entrance timing and treatment outcome. Not all individuals with chronic pain have the opportunity to enter multidisciplinary short-term intensive pain treatment shortly after their pain turns to chronic pain. Timing does not appear to be an important aspect of outcome, meaning that individuals can enter treatment after a long period of suffering from chronic pain and expect similar outcomes to those who have not carried a chronic pain diagnosis as long. However, patients with higher education levels may be more likely to seek early intervention for chronic pain conditions, increasing the effectiveness of treatment in reducing postpain levels. Based on current findings, although patients may participate in multidisciplinary short-term intensive pain treatment at any time, the level of postpain tended to be higher compared to those who sought early intervention through multidisciplinary treatment programs. Those who enter multidisciplinary short-term intensive pain treatment after longer periods of suffering from chronic postpain may not

experience similar outcomes to those who engaged in multidisciplinary short-term intensive pain treatment after shorter periods of suffering.

Limitations of the Study

This study was limited to three multidisciplinary short-term intensive pain treatment programs in the Pacific Northwest, providing 3 to 4 weeks of intensive in-house outpatient treatment. Findings may not be generalizable to other pain treatment programs or locations. The data collected were limited to numerical data in archived databases, which limited my ability to obtain a more detailed understanding of the experience of each participant. Self-reported data also limited the study, which was unavoidable because there was no better or more objective way of measuring pain, much less chronic pain. In addition, multiple psychological variables that had demonstrated predictive power in treatment outcome were not assessed or collected, and this was a limitation of the current study. The study was also somewhat limited by its use of historical data from multiple sources that may have used different methods and forms to collect the data. Although these data were valuable and easily accessible, I was not in control of how the data were collected and could not determine whether the collection methods were sound. The current study focused on entrance timing, which was not a controlled variable and may be related to other factors that confounded the findings. Only an experimental design with randomized participants would be able to determine whether there was a cause-effect relationship between entrance timing and treatment outcomes.

Recommendations for Research

I recommend that future studies be conducted using multiple geographical locations of similar short-term comprehensive programs to allow for greater generalizability of findings to other settings. Other pain programs consist of longer term treatment, fewer or more specialty treatment providers, or inpatient intensive stays, and comparisons between different treatment models may also be beneficial. The locations that provided data for the current study were all in the same general area providing the same type of treatment, so expanding the geographical reach of this type of research would provide a larger sample size and a more diverse population. A mixed-methods design would also be recommended to collect qualitative data regarding participants' experiences of multidisciplinary short-term intensive pain treatment programs. Future studies should also examine psychological variables contributing to the treatment of chronic pain, including cognitive, emotional, behavioral, and perception factors, to understand how such factors may impact pain levels and treatment outcomes (Gatchel, 2005; Kerns et al., 2011).

The findings of the current study may contribute to a growing body of knowledge regarding the predictors of multidisciplinary short-term intensive pain treatment program success. However, more research should be conducted incorporating qualitative methods to complement the quantitative results of this study. Future researchers are advised to consider psychological factors that may affect treatment outcomes in addition to demographic and treatment timing variables.

Implications for Positive Social Change

Current findings may impact individuals, their families, health care providers, and society. The results indicated that timing does not seem to be an important aspect of postpain outcome, meaning that individuals can access treatment after suffering from chronic pain for long periods and expect similar outcomes to those who have not carried a chronic pain diagnosis as long. Policymakers may use the knowledge gained from this study to assist in the development of appropriate treatment mechanisms considering that timing is not a factor influencing the outcome of treatment. Also, health care administrators may use the findings to raise awareness of the importance of timely diagnosis of illnesses for easier management of postpain levels.

Research findings highlighted education level as a predictor of multidisciplinary short-term intensive pain treatment program success in treating injured workers. As a result, patients with higher levels of education may use this study finding to understand the need for timely disease diagnosis to promote treatment outcomes despite the findings reporting lack of connection between time of entrance and post pain levels. Education level may impact patients' understanding of the influence of long periods of chronic pain before diagnosis. Such understanding may enhance early engagement of patients in multidisciplinary short-term intensive pain treatment resulting in positive treatment outcomes and effective management of postpain levels. Healthcare managers can also use these findings to develop policies such as creating awareness, especially among less educated patients, on the importance of pain management based on the education level or

socioeconomic status, age, and sex. The findings may help provide appropriate treatment to patients.

The knowledge gained from this study may assist in developing appropriate treatment regimens by health care professionals (Linton et al., 2018). The results may help hospitals educate patients by promoting the need for early diagnosis of diseases and entering multidisciplinary short-term intensive pain treatment, thus providing strong implications for patient's postpain level management, given the impact and cost that chronic pain has on the society. Improving individuals' functioning and well-being can also help minimize the strain the family unit feels. Although the study established that there was no significant impact of entrance timing to multidisciplinary short term intensive pain treatment programs on the postpain levels, the findings may help individuals to seek early treatment to control posttreatment pain and disability levels. As a result, despite its insignificance in predicting posttreatment pain levels, the findings of this study may assist individuals to understand the importance of early treatment intervention in managing pain before and after treatment.

While timing of entrance has been indicated to have no impact on post pain levels upon entering multidisciplinary short-term intensive pain treatment, healthcare providers can still emphasize the importance of early diagnosis and a multidisciplinary short-term intensive pain treatment approach among patients. Conversely, knowledge regarding education levels making a difference in outcomes can be useful for healthcare providers to educate and advise their patients and clients. Any research that focuses on improving outcome for individuals with chronic pain also has strong implications for social change,

given the impact and cost chronic pain has on society. The data for this study came from programs that provide four weeks of intensive pain management as an alternative to chronic medication usage. These treatment programs included physical therapy, occupational therapy, physical medicine, rehabilitation (medication tapering and adjustment to alternative medications), and symbological interventions including education, coping skills training, biofeedback, talk therapy, and relaxation training. Therefore, the information gained from this current study may help both patients and healthcare providers make informed choices about when individuals would benefit most from starting treatment of chronic health conditions using multidisciplinary short-term intensive pain treatment programs.

Summary

The findings of this study indicated that timing of treatment entry does not predict the success of multidisciplinary short-term intensive pain treatment. Education level was the only significant predictor of posttreatment pain level, but not of posttreatment disability. Those with at least a bachelor's degree had the lowest posttreatment pain levels. Improving the functioning and well-being of chronic pain patients can help minimize the strain the family unit feels. These findings, therefore, can be used by future scholars as their reference point in determining the importance of timing treatment in patients. The findings have added to past research by establishing that age, sex, and education levels are key predictors of postpain levels among patients. This calls for more research using qualitative first-hand data regarding patient perceptions of timing treatment.

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