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Pain Management, Gender, and Quality of Life in Cancer Patients

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2017

Abstract

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by

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MA, University of Montana, 1996

BS, University of South Florida, 1987

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

The type of cancer pain management used may have an effect on the quality of life (QOL) of cancer patients. Researchers have determined that cancer patients are inadequately treated for pain and pain management is an essential determinant of patient survivability and QOL. Numerous clinical studies have been accomplished concerning opioid administration and noncancer and cancer pain management exist. Previous studies have examined the relationship between cannabinoid products, noncancer pain, cancer pain, and related QOL for patients but have not focused on the QOL of cancer patients while also moderating for gender. These relationships were investigated using the health belief model. The cancer pain management treatments (opioids and/or marijuana [cannabis]) and QOL, measured with World Health Organization Quality of Life Survey (WHOQOL-BREF), of 236 cancer patients were analyzed using analysis of variance (ANOVA), planned contrasts, post hoc tests, and moderated ANOVA (PROCESS tool) in the causal–comparative research. Research findings indicated significant benefit in cancer patient physical and psychological QOL in participants using marijuana when compared to participants using opioids and physical QOL for participants using marijuana over participants using both opioids and marijuana combined. Enhanced pain management options for cancer patients in order to reduce opioid side effects, increase pain treatment effectiveness, and improve patient QOL could yield positive social change. Growing rates of opiate addiction, abuse, and mortality are public health concerns and cannabis may be an effective pain treatment to reduce these social costs. This research may be of use to legislators considering rescheduling marijuana to less than Schedule I.

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Dedication

To Melissa, who was the inspiration of this dissertation and my PhD journey. She was a daughter, sister, Marine, mom, and wife, who never stopped living and fighting. As a warrior and mentor, she was a positive influence to many people around the globe who were and are battling cancer. She is still spirit breathin'. I also dedicate this accomplishment to Valerie, who inspires and helps me to be a better person everyday.

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Chapter 1: Introduction to the Study

Introduction

According to the Centers for Disease Control and Prevention ([CDC]; 2016), deaths related to prescription opioids have reached epidemic levels over the last decade as 78 people die from overdose every day. Medical marijuana use, as a substitute for or complement to opiates, has shown similar or greater chronic pain relief while reducing opiate-related side effects (Lucas, 2012). States allowing medical marijuana use indicated a mean reduction in opioid-related deaths by 24.8% (Hayes & Brown, 2014). Therefore, use of medical marijuana for the treatment of chronic pain could provide social benefits by reducing mortality rates.

Cancer patients commonly use opioids to relieve mild to severe pain (World Health Organization [WHO], 1996). Haroutounian et al. (2016) studied medicinal cannabis use for chronic pain and showed reduced opioid use (i.e., a significant percentage of participants quit using opioids) while improving pain and functional outcomes over a 6-month study. Marijuana use has also been associated with improvements of pain, cognitive, and quality of life (QOL) factors in chronic pain suffers (Ware, Wang, Shapiro, Collet, & COMPASS Study Team, 2015). Current researchers have not measured cancer patients' pain and functional outcomes as related to QOL and opioid and/or medical marijuana pain management treatment choice. In this chapter I examine how the growing problems of opioid use and abuse are affecting society, background concerning opioid and medical marijuana use for pain, the purpose of this

study, the theoretical framework used, assumptions, scope, limitations, and significance of the study.

Background

The most effective pain management strategies often incorporate multiple mechanisms of action or methods (Rowe & Caprio, 2013). According to Pelayo-Alvarez, Perez-Hoyos, and Agra-Varela (2013), advanced cancer patients often rely on a strategy that focuses on symptom management and QOL maintenance; however, no current standard exists to measure the QOL of patients. Although QOL is related to the intensity of pain encountered, patients worldwide are experiencing inadequate and unacceptable levels of pain management therapies (Baek et al., 2013; Kwon et al., 2013; Wengström et al., 2014).

These inadequate pain management therapies could be the result of medical providers' concern for opioid abuse. These providers must balance efficacy and safety concerns when prescribing opioids because it has an association with abuse, overdose, and death (Rowe & Caprio, 2013). Zoëga, Fridriksdottir, Sigurdardottir, and Gunnarsdottir (2013) found 15% of their participants received adequate pain relief from stable doses of opioids, however, 53% had partial pain relief, and 19% experienced inadequate pain relief. Consequently, there is a gap in understanding pain management strategies because many complementary and alternative medicines are often not considered or available as viable options to traditional opioid treatments.

The use and effect of marijuana on men and women needs further research. Researchers reported medical marijuana was used by men and women almost equally

(i.e., 6% versus 5%) and most commonly for chronic pain, arthritis, migraine, and cancer (i.e., 31%, 11%, 8%, and 7%, respectively; Ryan-Ibarra, Induni, & Ewing, 2015). Despite apparent equal use, men and women do not respond equally to marijuana and research concerning these differences is lacking (Craft, Marusich, & Wiley, 2013).

Carter, Javaher, Nguyen, Garret, and Carlini (2015) presented evidence that marijuana could be a safer substitute or complementary treatment to address the growing medical concern over the opioid epidemic. Marijuana's research potential and medical acceptance have been prevented by several barriers: (a) political hesitancy and nonacceptance, (b) practitioner educational and training deficiencies, (c) patient-practitioner communication breakdown, and (d) practitioner concern over opioid abuse and hesitancy to advocate marijuana (Carter et al., 2015). Johnson, Lossignol, Burnell-Nugent, and Fallon (2013) indicated a reduction in pain levels in many advanced cancer patients over the long-term with level doses of a cannabis oromucosal spray (i.e., 50% tetrahydrocannabinol [THC] / 50% cannabidiol [CBD] mixture known as nabiximols or Sativex®). Other researchers indicated that cannabis use was associated with pain level, QOL, and cognitive function improvements over a 1-year study (Ware et al., 2015). Further, Kral et al. (2015) indicated that cannabis use was associated with reduced pain levels and nonmedical use of opioids in participants. Cannabis reset opiate analgesia and eliminated chronic users need to increase opiate dosage to reduce pain (Lucas, 2012).

Chronic pain elicits many burdens on society, and the cost of lost productivity and medical treatments attributable to chronic pain were estimated at $635 billion each year in the United States alone (Institute of Medicine, 2011). Researchers indicated chronic

pain patients being treated for opioids encountered more problems than those treated with medical marijuana (Feingold, Goor-Aryeh, Bril, Delayahu, & Lev-Ran, 2016). Although nontraditional pain management treatments exist (i.e., cannabis), for many chronic pain sufferers (e.g., cancer patients) this option is not always viable because medical use of cannabis is not legal in all states, countries, territories, or areas of the world (Rowe & Caprio, 2013).

Problem Statement

According to the WHO (1997b), the QOL of individuals incorporate life perceptions in the context of cultural and value systems as related to expectations, concerns, standards, and goals. The QOL of patients is often correlated to pain endured and the corresponding pain management mechanism(s) of action; in general, patients around the globe have not received sufficient pain therapies thus QOL is affected (Baek et al., 2013; Kwon et al., 2013; Wengström et al., 2014). Opioids are the most commonly used substance to ease cancer patients' mild to severe pain (WHO, 1996).

Concerning cancer outpatient pain management care, opioids are the traditional and gold standard treatment (Baek et al., 2013; Whistler, 2012), and researchers have completed many studies using opioid administration as the primary pain management methodology concerning patient QOL (Baek et al., 2013; Gaertner & Schiessl, 2013; Kwon et al., 2013; Lee et al., 2014). Both sales and deaths related to opioids have quadrupled over the last 15 years (CDC, 2016). Further, chronic pain suffers (e.g., cancer patients) often face dependence and side effect escalation issues due to opioid-related tolerance increases (Whistler, 2012). Opioid use, especially chronic use, can cause many

side effects including respiratory depression (Baldini, Von Korff, & Lin, 2012; Perlman et al., 2013; Whistler, 2012), constipation (i.e., 40-95% occurrence rate; Kumar, Barker, & Emmanuel, 2014; Perlman et al., 2013), cardiovascular effects, central nervous system effects (Cobaugh et al., 2014; Baldini et al., 2012), musculoskeletal system effects, endocrine system effects, and immune system effects (Baldini et al., 2012). Opioids also increased hyperalgesia, stress, and depression (Berland & Rodgers, 2012; Cobaugh et al., 2014; Hayes & Brown, 2014), led to abuse, even for nonmedical users (Hayes & Brown, 2014), increased the need for health care, and lowered QOL (Berland & Rodgers, 2012; Cobaugh et al., 2014).

The use, abuse, morbidity, and related mortality of opioids have reached epidemic levels in society (CDC, 2012, 2016; Garcia, 2013; Rowe & Caprio, 2013). In the United States, 78 people die from opioid overdose every day and 60% of all drug overdose deaths involve opioids (CDC, 2016; Rudd, Aleshire, Zibbell, & Gladden, 2016). Because new cancer pain pharmacological developments in research and development are exclusively opioid related (Caraceni et al., 2012), the focus of research on opioids has led to opportunities to study other pain management treatments. Therefore, understanding traditional opioid treatments and nontraditional, nonopioid alternatives on cancer patients' QOL is worthy of further research (Rowe & Caprio, 2013). Research concerning the efficacy of many nontraditional pain management treatments in relationship to cancer patient QOL and gender has not been conducted to date.

Purpose of the Study

The purpose of the nonexperimental research was to determine the effects different types of cancer pain management treatments may have on cancer patients' QOL. The study involved elements of the health belief model (HBM; Hochbaum, Rosenstock, & Kegels, 1952) including benefits, barriers, cues to action, and self-efficacy concepts (Abraham & Sheeran, 2005; Broussard & Weber-Breaux, 1994; Rosenstock, Strecher, & Becker, 1988; Wallace, 2002). Pain management therapies for cancer patients (i.e., defined by traditional [i.e., opioids], nontraditional [i.e., marijuana, also known as cannabis], and combined nontraditional and traditional) are often related to these HBM concepts and QOL is affected. Pain management is an essential determinant of patient outcomes because unrelieved pain significantly comprised patient QOL and effective pain management was associated with patient survival (Perlman et al., 2013).

Gender (i.e., male and female) was also examined to determine if it affects the difference in cancer patient pain management and QOL. Researchers have indicated mixed results concerning use and abuse of both opioids and marijuana when gender is considered (Greenfield, Back, Lawson, & Brady, 2010). Relationships concerning gender, pain sensitivity, and pain management treatments warrant further investigation (Cooper & Haney, 2016; Lenz et al., 2011). Gender provided a research opportunity because effects of opioid and marijuana on cancer patient QOL have not been evaluated under these conditions.

Pain is a secondary health problem that many cancer patients suffer which may relate to their QOL (Shneerson, Taskila, Gale, Greenfield, & Chen, 2013). Cancer

patients often use (i.e., 40% in North America, Australia, and Europe) complementary and alternative medicine (CAM) options to reduce the side effects of treatment and improve QOL, but many of these CAM options require further study in order to determine their efficacy (Horneber et al., 2011; Shneerson et al., 2013). Ben-Arye et al. (2014) explored CAM in cancer care and determined relationships with expected QOL improvement, pain reduction, and herbal medicine use; however, cannabis use was not part of the research parameters. Zaller, Topletz, Frater, Yates, and Lally (2015) studied 200 medial cannabis users and found chronic pain management, improved pain relief, and opioid alternative as the predominant reasons for cannabis use. My research focused on nontraditional (i.e., cannabis) and/or traditional pain management (i.e., opioids) treatments and their relationship to cancer patients' QOL.

Research Questions and Hypotheses

Two quantitative research questions (RQs) and corresponding null and alternative hypotheses were derived from theory and provided the focus for this study.

Research Question 1: To what extent, if any, is there a difference between cancer patient's quality of life (QOL) and types of cancer pain management therapy (i.e., traditional prescription based therapy [i.e., opioids], nontraditional based therapy [i.e., cannabis], and combined traditional and nontraditional therapy)?

Independent variable: Cancer pain management, described as:

- Traditional prescription based therapy (opioids)
- Nontraditional based therapy (cannabis)
- Traditional and nontraditional therapy

Dependent variable: Quality of life

H_o1: Quality of life will not differ between cancer pain management types.

H_a1: Quality of life will differ between cancer pain management types.

Research Question 2: To what extent, if any, does gender affect the relationship between cancer patient's quality of life and types of cancer pain management therapy (i.e., traditional prescription based therapy [i.e., opioids], nontraditional based therapy [i.e., cannabis] and combined traditional and nontraditional therapy?

Independent variable: Cancer pain management, described as:

- Traditional prescription based therapy (opioids)
- Nontraditional based therapy (cannabis)
- Traditional and nontraditional therapy

Dependent variable: Quality of life

Moderator: Gender (female or male)

H_o2: The impact of cancer pain management type on quality of life is not moderated by gender.

H_a2: The impact of cancer pain management type on quality of life is moderated by gender.

Theoretical Framework

In the early 1950s, social scientists developed the HBM in order to close gaps in psychological models when trying to enhance health education programs, assist preventative health behavior services, and explain how individuals fail to adopt disease prevention strategies (Abraham & Sheeran, 2005). There are six latent constructs used to

describe the HBM: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Jensen, Nielson, & Kerns, 2003). The first four constructs were developed to describe the original HBM while self-efficacy (Rosenstock et al., 1988) and cues to action were added to the HBM construct as research progressed (Abraham & Sheeran, 2005). The HBM is descriptive in nature rather than causal (Abraham & Sheeran, 2005). HBM is based upon Lewin's (1951) idea of valence and the expectancy-value model where the perceiver's beliefs, either positive or negative, determines what an individual will and will not do (Lewin as cited in Abraham & Sheeran, 2005).

The original HBM focused on the preventative behavioral perspective but later was expanded to other health related activities (Abraham & Sheeran, 2005; Beehler, Rodrigues, Kay, Kiviniemi, & Steinbrenner, 2014). Individuals choose various courses of actions depending on their perceptions of potential benefits and costs related to the health behavior (Abraham & Sheeran, 2005; Rosenstock, 1974). HBM does not suggest strategies to change or predict health behavior but only describes tenants that could influence the health related action and/or behaviors (Abraham & Sheeran, 2005; Davey, 2011). Other limitations concerning HBM exist.

Limitations of the HBM include its explanatory focus and exclusion of environmental factors. HBM does not account for personality traits and habitual schemas (e.g., extraversion, agreeableness, neuroticism, openness, or conscientiousness; Abraham & Sheeran, 2005; Davey, 2011). Abraham and Sheeran (2005) cited that HBM fails to account for many environmental factors during personal decision-making. Other

researchers consider environmental factors while examining the barriers construct (Tuzcu & Bahar, 2015) or consider using them during future HBM-based framework studies (Coursaris et al., 2015).

The strongest predictors of individuals' health beliefs were perceived barriers and benefits as indicated by various scaled assessment measures (Jones, Smith, & Llewellyn, 2014). Jones et al. (2015) found barriers to be the most powerful indicator. My research focused on the various HBM concepts related to the pain management and QOL of cancer patient participants, and these concepts were expanded in Chapter 2. Measuring QOL reliably can be a challenge because no universal instrument exists (Pelayo-Alvarez et al., 2013).

Skevington, Lotfy, and O'Connell (2004) validated a QOL instrument and found it to be a reliable assessment tool for patients. The QOL instrument is based on a 5-point standard intensity scale broken down into four domains (i.e., physical health, psychological, social relations, and environment; Skevington et al., 2004). I used this instrument during my dissertation research. Because cancer patients suffer multiple physical and psychological symptoms that relate to QOL, researchers can use descriptive statistics on quantitative data derived from QOL instruments (Barre, Padmaja, Saxena, & Rana, 2015). Josyula and Lyle (2013) used the HBM construct and converted survey data into continuous variables and multiple methods including analysis of variance (ANOVA) in their evaluation.

Nature of the Study

The quantitative, nonexperimental research design included causal-comparative design, descriptive statistics, and cross-sectional survey data. Causal–comparative research does not seek cause and effect relationships because the data are collected through environmental course and not experimental design (Field, 2013). This approach provided the method to assess the difference between participant dependent variable (i.e., QOL) and pain management choice and gender. The research variables, as related to the specific participants, were analyzed using ANOVA and inferential statistics (Creswell, 2009). Data were gathered at a specific time rather than over multiple time periods to reduce the effects that time might have on QOL (Creswell, 2009; Field, 2013).

The design was essentially correlational because an experimental design was not used. According to Ravid (2011), correlational designs measure the relationship between variables; however, a correlational design does not support causal direction in variable relationships and many variables are often not controlled (Field, 2013). Further, survey data in social science research frequently uses cross-sectional design (Creswell, 2009; Frankfort-Nachmias & Nachmias, 2015). Therefore, instead of focusing on cause and effect, the study used descriptive, co-occurring proximal measurements to reveal the categorized outcomes of participants (Field, 2013).

Concerning measurement of the dependent variable, QOL, an existing validated and reliable instrument (i.e. WHOQOL–BREF) was used. The WHOQOL-BREF survey (See Appendix A) is a shortened version (i.e., 26-questions) of the original WHOQOL-100 (i.e., 100-questions) survey and was used in accordance with WHOQOL Group

standard procedures (Bonomi, Patrick, Bushnell, & Martin, 2000; Skevington et al., 2004; WHOQOL Group, 1996). Because web-based collection was preferred, the paper version of the WHOQOL-BREF was converted to an Internet version to facilitate administration, data collection, and analysis. The WHO approved use of the WHOQOL-BREF for my dissertation research (See Appendix B). Data collection was accomplished with this valid, reliable, and usable instrument (Skevington et al., 2004). The information gathered was treated as sensitive, and appropriate data security procedures were followed (e.g., data files were password protected; research computers were password protected and in secured locations; and SurveyMonkey used secure data protection technology; SurveyMonkey, 2016a).

Definitions

For purposes of this study, the following terms were defined:

Quality of Life: Given the perception of culture, values, goals, expectations, standards, and concerns, a broad concept incorporating individuals' "physical health, psychological state, level of independence, social relationships, personal beliefs and their relationship to salient features of their environment" (WHO, 1997b, p. 1).

Cancer pain management therapy: Treatments to relieve pain in cancer patients that may be caused by the cancer itself, cancer related issues (e.g., constipation, muscle spasm, bedsores), or concurrent processes (e.g., osteoarthritis; WHO, 1996).

Traditional prescription based therapy [e.g., pharmaceuticals]: Various opioid treatments; three-step analgesic protocol incorporates opioids for mild to moderate (i.e., Step 2) and moderate to severe (i.e., Step 3) cancer pain management (WHO, 1996).

Non-traditional based therapy [i.e., cannabis]: Medical marijuana or cannabis; outside of standard medical approaches through acceptance of alternative medical treatments (e.g., many U.S. states have accepted marijuana as a nontraditional medical treatment for pain; Witte, 2013).

Combined traditional and non-traditional therapy: Use of both types of treatments for cancer pain management.

Gender: Either male or female from the participant's perspective (Kuper, Nussbaum, & Mustanski, 2012).

Assumptions

The positivist perspective was taken over the antipositivist perspective. The relationship between pain management and QOL was assumed to be objective and externally observable vice subjective (Jean-Lee, 1992). Researchers using a positivistic approach attempt to study parts of the whole situation by uncovering causal relationships to understand the world (Jean-Lee, 1992). The researcher using the antipositivist perspective examines the complexity of social reality by "being involved in these realities" (Doğan, 2013, p. 248). Positivist researchers provide unbiased reports of empirical findings and descriptions of the observed reality (Wicks & Freeman, 1998). My research took the positivist perspective through survey methodology, data collection, and analysis to reveal the relationships between relevant variables.

Because pain is one of the biggest indicators of cancer patient QOL, it is assumed the WHOQOL-BREF survey captures relevant HBM constructs relative to pain management choice. Pain management is an essential determinant of patient QOL

(Perlman et al., 2013). Thus, the four domains (i.e., physical health, psychological, social relations, and environment) captured in the WHOQOL-BREF represented the HBM constructs examined (Skevington et al., 2004).

An anonymous and voluntary participation protocol was used via a computer-administered survey tool (i.e., via SurveyMonkey), which increased the probability of collecting honest responses (Lucas, Gratch, King, & Morency, 2014). The assumption of honesty in participant responses should reveal an objective reality. Also, the purposive sampling methodology was assumed to produce a relative representative sample. Although convenience sampling has limitations, it provided an opportunity to collect vital information from population participants that may replicate the whole research population.

Scope and Delimitations

The scope of the study was limited to cancer patients meeting specific inclusion criteria (i.e., diagnosed with cancer, at least 18 years of age, experienced chronic pain, and may or may not be undergoing treatment), which reduced the effect of confounding variables. Patient QOL is often correlated to pain endured, which corresponds to the pain management therapy used (Baek et al., 2013; Kwon et al., 2013; Wengström et al., 2014). The choice of cancer patient pain management therapies (i.e., opioids and cannabis) and QOL variables are related and may determine patient outcome and survival (Perlman et al., 2013; Shneerson et al., 2013). Further, a quantitative approach using a validated, reliable, and usable instrument helped reduce the effect of researcher bias. This

instrument ensured the effect being measured, QOL, was accurately reflected (Skevington et al., 2004).

Every survey method has advantages and disadvantages, and online surveys are not excluded. Online surveys have a limited sampling frame (i.e., only 75% of the population has computer access) and racial disparity via this access exists (Rudestam & Newton, 2015). Although the personal interview method has high response rates (i.e., unless potential participants are unwilling), the cost of personal interviews due to the geographic separation of the target population and the personal nature of some survey questions (i.e., asked in an open, nonprivate setting) are both prohibitive factors (Rudestam & Newton, 2015). Both active and passive recruitment strategies were used in targeted areas to address the potential cost and response problems (Fleming et al., 2015). Specifically, distribution of recruitment flyers in participating organizations in combination with the purposive sampling technique helped obtain a sample that represents the specified cancer patient population.

Limitations

Potential weaknesses of the study include sampling technique, inferential statistics, and type of statistical analysis used. Because a purposive sampling methodology was used, generalization to the greater population may be limited (Frankfort-Nachmias & Nachmias, 2015). However, it is assumed that the targeted sample will be a representative sample of the population under study. Additionally, because inferential statistics was used to draw conclusions, the possibility of committing a Type I error exists; that is, where a true null hypothesis is incorrectly rejected

(Frankfort-Nachmias & Nachmias, 2015). However, to mitigate this concern, the confidence level to determine acceptance of the null hypothesis was set at .05. This means that the probability of error will be less than 5%.

Comparative designs naturally limit generalizability given the nature of the variables (Tabachnick & Fidell, 2014). The dependent and independent variables were assigned by environmental relationship not experimentation. The large population base limited use of a true experimental methodology using random assignment.

Significance

Determining relationships between pain management methods and cancer patients' QOL may help to enhance lives and contribute to positive social change. The number of annual cancer cases worldwide will reach over 20 million in the next 15 years, and pain management and QOL for cancer patients are primary concerns to health providers and affected patients (Kwon et al., 2013; Pelayo-Alvarez et al., 2013; WHO, 2015). New medical therapies hold the potential to create positive social change if they are found to provide significant benefit over current therapies (Benton, González-Jurado, Beneit-Montesinos, & Fernández, 2013). Pain management alternatives with less side effects, morbidity, or related mortality that provide patients equal or greater QOL could provide positive social value.

Overall, opioid related abuse, morbidity, and mortality have reached epidemic proportions in society (CDC, 2012, 2016; Garcia, 2013; Rowe & Caprio, 2013). Political obstacles and corporate influences (e.g., pharmaceutical industry) have created barriers for researchers studying cannabis (Bostwick, 2012; Cohen, 2009a, 2009b, 2010). These

researchers have been excluded from participating in established drug testing protocols and processes (Bostwick, 2012; Cohen, 2009a, 2009b, 2010). As researchers examine evidence concerning pain management options, benefits, barriers, cues to action, and self-efficacy could be affected. The potential effects of medical interventions on psychological factors, such as QOL, have been inadequately studied, and assessment of cancer patients' QOL is a neglected research area (Barre et al., 2015).

Findings from my study could provide medical practitioners greater understanding concerning how pain management preference affects cancer patients' QOL and contribute to positive social change. Effective pain management is an essential determinant of patient QOL, outcome, and survival (Perlman et al., 2013). Many cancer patients suffer pain related symptoms and problems and these health related factors may correspond to their QOL (Shneerson et al., 2013). Cancer patients experienced significantly lower QOL with higher levels of pain; despite use of strong opioids, many cancer patients regularly encountered severe pain (Zoëga et al., 2013).

Because over 80% of cancer patients require opioids for pain management and patients are often undertreated for pain (Nersesyan & Slavin, 2007; Tanco, Bruera, & Bruera, 2014), individual choice of opioid use needs to be more personalized (Tanco et al., 2014). Enhancement of available pain management mechanisms of action that reduce opioid side effects and may improve patient QOL could provide significant benefit to society. Exploration into the under treatment of cancer pain is a necessity because improving cancer patient QOL is an important goal of health care (Zoëga et al., 2013).

The long-term effects of opioid use are mostly negative because only the minority of patients experience benefits (Becker, Fiellin, Black, & Kostovich, 2016). The negative consequences of long-term opioid use include safety issues (e.g., mild to severe toxicities), overdose, and death (Becker et al., 2016). The adverse effects of opioid use make it a poor long-term option (Hayes & Brown, 2014). In the majority of cases concerning opioid treatments, patients are either being undertreated and experience constant pain or over treated and experience various levels of harmful toxicity. Determining acceptable treatment alternatives to help balance these extreme situations could lead to policy changes and treatment options that could contribute to positive social change.

Despite yielding benefits to patient QOL, very few nontraditional or traditional pain treatments are without complications and side effects. Cannabis use for chronic pain has shown increased risk of nonserious adverse events (e.g., most common were nausea, dizziness, drowsiness, headache, and nasopharyngitis) but no difference in risk of serious adverse events in a 1-year control group study were indicated (Ware et al., 2015). Further, long-term side effects of cannabis medical use have yet to be fully studied (Haroutounian et al., 2016; Ware, et al., 2015). Although opioids have many adverse side effects and addictive potential, researchers recommend continued opioid therapy for chronic cancer pain in order to provide pain relief for patients (Nersesyan & Slavin, 2007) and find high dose opioids safe and effective for terminal cancer patients (Baek et al., 2013). Because complementary and alternative treatments for opioid pain

management treatments exist and cannabis seems to have less long-term side effects, further research is warranted.

Research into substituting cannabis for or adjutant with opioids in pain-related cases is justified for public health reasons due to cannabis being a potentially safer mechanism of action (Lucas et al., 2015). The United States is a prime area of concern because its population typically consumes 80% of the world's opioid supply while having less than 5% of the global population (Manchikanti, Fellows, & Ailinani, 2010). Between 1999 and 2010, U.S. states with medical marijuana legislation had nearly a 25% lower mean annual rate of opioid overdose and mortality than states without such laws (Bachhuber, Saloner, Cunningham, & Barry, 2014). Potentially reducing the toxic effect of opioids on cancer patients should be a treatment consideration. A single focused strategy to decrease cancer patient pain without consideration of these toxic and potentially deadly side effects seems counterintuitive to overall patient QOL. Further, my findings may help advance the in-depth understanding about how gender affects the relationship between pain management preference and QOL.

Summary

Pain management for cancer patients is inadequate and additional research and treatments are needed to improve patient QOL (Zoëga et al., 2013). In many U.S. states and areas of the world, opioids are the primary, legal pharmacological option for relieving cancer pain. Opioids are the primary pain management therapy for cancer patients (Nersesyan & Slavin, 2007; WHO, 1996). Even with strong doses of opioids, many cancer patients are still undertreated and encounter severe pain, which impacts their

QOL (Nerseyan & Slavin, 2007; Tanco et al., 2014; Zoëga et al., 2013). According to Nersesyan and Slavin (2007), more than 50% of cancer patients are insufficiently treated for and about 25% die in pain. Long-term opioid use is also associated with many negative side effects, which can decrease patient QOL (Berland & Rodgers, 2012; Hayes & Brown, 2014).

Opportunity exists to enhance pain management options for cancer patients in order to reduce opioid side effects, increase pain treatment effectiveness, and improve patient QOL. Haroutounian et al. (2016) suggested that cannabis therapy for patients suffering chronic pain resulted in decreased opioid use while improving patient pain and QOL measures over the long-term. Understanding the relationship between cannabis and/or opioid use for cancer patient pain management and their QOL outcome could help further the existing body of knowledge.

I introduced the problem and study in Chapter 1 and provided background, purpose, theoretical base, terms, assumptions, limitations, and significance to support the project. Chapter 2 will include a review of current literature and studies related to cannabis, opioids, pain management, and QOL.

Chapter 2: Literature Review

Introduction

The QOL of patients and their pain management treatment are often correlated, and patients worldwide are being treated for pain ineffectively (Baek et al., 2013; Kwon et al., 2013; Wengström et al., 2014). Opioids are the most commonly used substance to ease cancer patients' mild to severe pain (WHO, 1996). The majority (i.e., 70-80%) of cancer patients with advanced disease suffer moderate to severe pain but many do not receive appropriate pain relief (Caraceni et al., 2012). For outpatient cancer related pain management, opioids are the primary and gold standard treatment (Baek et al., 2013; Whistler, 2012). Chronic opioid users face dependence and many associated side effects (Whistler, 2012), including lower patient QOL (Berland & Rodgers, 2012; Cobaugh et al., 2014). Over the last 15 years, opioid related sales and deaths have quadrupled (CDC, 2016).

Patient outcomes rely on pain management treatments because unrelieved pain significantly comprised QOL and affected cancer patient survival (Kahan, 2014; Perlman et al., 2013; Shneerson et al., 2013). The purpose of the causal comparative research was to determine the effects different types of cancer pain management treatments may have on the QOL of cancer patients. Pain management therapies defined by traditional (i.e., opioids), nontraditional (i.e., marijuana), and combined nontraditional and traditional were examined. Although 28 states, the District of Columbia, Puerto Rico, and Guam have medical marijuana programs (National Conference of State Legislators, 2016), many cancer patients do not have legal access to these treatment options (Rowe &

Caprio, 2013). Understanding the relationship between marijuana and opioid use for cancer patients and their related QOL provides opportunity to reduce side effects, increase pain treatment effectiveness, and improve patient QOL.

In this chapter, I review current research and literature related to pain, cancer, opioids, marijuana, gender, and QOL. Key areas include the literature search strategy, theoretical foundation review, and review of key variables and concepts.

Literature Search Strategy

Research articles were found through Walden University databases including EBSCOhost, ProQuest, MEDLINE, PubMed, CINAHL Plus, ScienceDirect, and Sage; Google Scholar, American Medical Directors Association, and Research Gate were also used. I included peer-reviewed literature since 2010 and prior seminal literature identified by using keywords pain, pain management, cancer, opioid, cannabis, marijuana, gender, quality of life, health belief model, and theoretical framework.

Employment of Health Belief Model

Although the HBM was originally constructed to analyze preventative health behaviors, it has been used for other health related contexts (Abraham & Sheeran, 2005; Beehler et al., 2014). Badr et al. (2013) examined childhood cancer survivors and associated lifestyle behaviors and intervention preferences with specific QOL determinants. Lim, Gonzalez, Wang-Letzkus, and Ashing-Giw (2009) studied the relationship between health behaviors and QOL determinants from the perspective of various social and cultural factors using HBM. Park, Clement, Hooyman, Cavalie, and

Ouslander (2015) used the HBM construct as a foundation to evaluate various nonpharmacological pain management treatment options for chronic pain suffers.

Expanding upon these previous QOL and pain management related studies, my research used HBM to explore whether there was a relationship between pain management treatment therapy and personal perceptions of QOL. HBM helps explain the relationship between an individual's beliefs, including perceived benefits, perceived barriers, perceived severity, perceived susceptibility, self-efficacy, and cues to action, and their influence on healthcare related behaviors (Rosenstock, 1974; Rosenstock et al., 1988). The developers of HBM primarily focused on the present beliefs of the perceiver and the perceiver's physical environment only to the extent of how it affected these beliefs and impending behavior (Rosenstock, 1974). Although HBM has been used in many health behavior related studies, the specific strength of relationships, influence, and interaction between all six constructs is not known (Jones et al., 2015).

Previous studies have discovered various strengths, limitations, and interactions for the constructs that inspire use of HBM. The perceived benefits criteria are often subjective and not always based upon objective facts (Coursaris et al., 2015). While perceived benefit outcomes included increased self-confidence, social support, and mental focus, perceived barriers that hindered success included lack of internal motivation, external social support, and options and time (Das & Evans, 2014). Park et al. (2015) determined that the strongest predictor of nonpharmacological pain treatment was perceived severity while perceived barriers was the weakest. Janz and Becker (1984) and Jones et al. (2015) found perceived barriers to be the most powerful overall indicator.

The perceived constructs have many influences. Self-efficacy criteria are not always negative because it also represents positive factors that help an individual obtain the desired health goal or outcome (Coursaris et al., 2015). The perceived barriers and self-efficacy criteria often relate to physical and psychological factors creating avoidance mechanisms to obtain the health related behavior (Rosenstock et al., 1988). HBM's self-efficacy and cues to action components open up behavioral components of individuals to be analyzed in depth (Skinner, Tiro, & Champion, 2015).

Cues to action for a patient can be either internally (e.g., mental or physical state of being) or externally (e.g., reminder trigger or message) driven (Coursaris et al., 2015). These cues can provide the impetus to act when the other factors were insufficient to tip the balance (Rosenstock, 1974). Positive factors of confidence, support, and knowledge can counter negative feelings of depression, low self-esteem, and distress to help patients adapt to their changing circumstances and environment (Coursaris et al., 2015). Measuring the effects of cues to trigger action can be difficult (Rosenstock, 1974). Another complex construct in the HBM is self-efficacy.

Self-efficacy toward an outcome accomplishment often varies on perceptions and expectations of effort required (Broussard & Weber-Breaux, 1994). Positive or negative self-efficacy often determines how well an individual is able to handle both expected and unexpected events and circumstances (Broussard & Weber-Breaux, 1994). Internal and external lived, learned, and persuasive forces influence both the level and direction of self-efficacy (Broussard & Weber-Breaux, 1994). While self-efficacy is included as a separate element in HBM, it can influence the other constructs and the overall perception

and action taken (Rosenstock et al., 1988). Despite the advantages of incorporating self-efficacy and cues to action constructs into a research construct, most research focuses on one or more of the four other criteria (Jones et al., 2015).

HBM and Quality of Life

Researchers found that QOL consideration of individuals encompassed both mental and social health-related issues (Das & Evans, 2014). Scales measuring perceived barriers, perceived benefits, and self-efficacy were found to be both valid and reliable when assessing cancer screening health beliefs for women (Anagnostopoulos, Dimitrakaki, Niakas, & Tountas, 2013). Badr et al. (2013) examined the association between childhood cancer survivors' diet and exercise behaviors and their QOL. Badr et al. (2013) concluded that barriers to reducing risk, increasing healthy lifestyles, and improving cancer patient QOL need further research.

The overall premise of HBM rests upon individuals taking health-related actions in order to avoid negative health conditions (Ghaffari, Tavassoli, Esmaillzadeh, & Hassanzadeh, 2012). Individuals take and avoid actions and activities based upon a balance between perceived positive and negative forces impacting their life space (Rosenstock, 1974). Beehler et al. (2014) discovered six factors related to positive or negative influences toward achievement of a health change behavior in cancer patients (i.e., environmental, health service delivery, health-related, attitude, self-efficacy, and motivation). Finding one appropriate measurement to collect and evaluate all of these health change factors remains a challenge (Beehler et al., 2014). These previous factors relate closely to those measured by the WHOQOL-BREF survey.

This survey is broad and complex capturing elements of physical, psychological, independence, social relationships, personal beliefs, and environment related to the health of an individual (WHO, 1997b). The influence of one factor (e.g., social support) to different constructs of the HBM (e.g., perceived benefits and barriers) seems to indicate the possible use of an overall assessment of a factor (e.g., QOL measure based upon multiple influences or domains) to represent a construct of the various HBM components. The WHOQOL-BREF captures the positive and negative aspects of a participant's life and is one of the leading generalized QOL instruments (Skevington et al., 2004).

Operationalizing the Framework

The theoretical components of HBM are based upon psychological and behavioral factors influencing individuals' pursuit of a health outcome and estimate of actions to achieve the goal (Janz & Becker, 1984). HBM helps researchers analyze behavioral change as the balance between perceived incentives, threats, benefits, costs, and competency of taking action to change (Rosenstock et al., 1988). Conceptualization of HBM incorporates behavior to achieve the health-related end state and perception of the effectiveness of these actions or inaction (Janz & Becker, 1984). Most researchers using the HBM construct have developed new ways to operationalize their specific variables (Janz & Becker, 1984).

Self-evaluation surveys, including life satisfaction criteria, are considered valid instruments to evaluate health status and have shown to have better predictive properties than many objective measures (Idler & Benyamini, 1997). Aggarwal et al. (2013) used QOL surveys to evaluate the effectiveness of medical marijuana treatments. Park et al.

(2015) used a modified HBM structure to determine the influence of individual health beliefs on pain management choice. Self-evaluative HBM structured surveys have been used to help capture the complexities concerning patient QOL and pain management decisions.

Social and environmental factors of HBM often play an important part in decision-making and QOL for individuals. The beliefs of individuals, influenced by social and environmental pressures, concerning the "availability and effectiveness of various courses of action, and not the objective facts about the effectiveness of action" determine the specific course taken (Rosenstock, 1974, p. 331). Lim et al. (2009) examined the relationship of cultural health beliefs on health behaviors in order to affect participant QOL. Patient QOL is multifaceted.

According to Baek et al. (2013), "one of the purposes of pain control for cancer patients is to improve QOL" and QOL should be used in the assessment of pain control (p. 1870). The HBM construct helped operationalize scaled values representing chronic pain with associated nonpharmacological pain therapies (Park et al., 2015). Bauml et al. (2015) found that the attitudes and beliefs of cancer patients were the most important factor regarding the use of CAM and integrative treatments. HBM has been used to evaluate various pain management treatments.

Researchers synthesized studies and determined that the majority (i.e., 50%–91%) of cancer patients adhered to prescribed opioid medication recommendations but others (i.e., 22%–27%) used opioids as needed (Butow & Sharpe, 2013). Although nonadherence to prescribed pain treatments is common, self-managed adherence typically

is positively associated with perceived benefits (Butow & Sharpe, 2013). Carter et al. (2015) identified various barriers related to medical practitioners including political, educational, training, and communication factors affecting prescribed pain management treatments. There are concerns with the current pain management approach (e.g., patient perception of intervention and patient-medical provider communication problems; Butow & Sharpe, 2013). Pain endured and corresponding pain management treatments are often correlated to the QOL of patients (Baek et al., 2013; Kwon et al., 2013; Wengström et al., 2014).

Employing the WHOQOL-BREF

The WHO defines and measures health from the perspective of QOL, which includes physical, mental, social, and disease perspectives (WHO, 1997b). These QOL assessments and measures include self-perceptions of life circumstances including culture, social relationships, beliefs, values, independence, expectations, goals, standards, and concerns (WHO, 1997b). The WHOQOL-BREF focuses and derives values representative of individuals' perception of well-being, general health belief, and QOL (WHO, 1997b). The WHOQOL-BREF has been tested for validity and reliability across different populations and countries, has been used in health research, and can help to evaluate various treatments (WHO, 1997b). The WHOQOL-BREF assesses four domains: physical, psychological, social relationships, and environment.

The pain cancer patients experience is based on many different domains (i.e., physical, psychological, social, cultural, self-perception [e.g., senses, cognition, and behavior]; Dalal, Tanco, & Bruera, 2013). Based upon all of these factors, cancer patients

choose the most appropriate pain management therapy (Dalal et al., 2013). The QOL of patients can be assessed and measured through self-perceptions of life circumstances including physical, psychological, social relationships, and environment (WHO, 1997b). A valid, reliable, and precise health-related QOL measures the effects of emotional, physical, social, and lifestyle issues and can evaluate whether treatments lead to a life worth living (Bowling, 2014). These factors create a link and opportunity to assess the relationship between the QOL of patients and their respective pain management therapy.

Limitations

There are several limitations to this framework. Although researchers have consistently used the flexibility of the HBM, this practice has led to a lack of standardization in interpreting results (Janz & Becker, 1984). Badr et al. (2013) did not assess treatment or cancer type into their QOL study, which may limit the impact of various cancer types and treatment options causing a differential in participant QOL. This study used a comprehensive, summary measure for HBM and did not evaluate the specific type or methodology of cannabis or opioid used in pain management.

Opioid and cannabis use for pain management offers a complex array of choices. There are multiple clinical guidelines concerning the use of opioids for pain relief (Caraceni et al., 2012). There are hundreds of different cannabis strains and many different methods of consumption or use (e.g., smoking, vaporizing, oil, edible, and topical; Kral et al., 2015). Given all of these possible variations, the assumptions were opioid and cannabis users had experimented with many of the possible types, strains, and methods available and had determined the options that best met their situation. The

personal preferences of cancer patients should be a vital factor in their own pain management therapies (van den Beuken-van Everdingen et al., 2016).

Cost and legality was also not factored into the analysis. Two barriers to cannabis use include affordability and fear because prescription medications are typically subsidized in most medical insurance programs and cannabis is not widely accepted legally at various governmental levels (Lucas et al., 2015). Without federally approved synthetic cannabis medications for pain, U.S. patients must self-fund cannabis-related products through legal state controlled dispensaries or illegally through other suppliers (Boehnke, Litinas, & Clauw, 2016).

The current Schedule I status of cannabis has limited past and limits future research (Savage et al., 2016). Concerning cannabis, scientific evidence and political ideology often collide when efficacy, safety, individual choice, and public health are debated (Savage et al., 2016). Researchers have been affected by strict government control limiting funding, restricting cannabis supplies and types, and risks of criminal prosecution (Aggarwal, 2013; Savage et al., 2016). Although some medical associations and groups (e.g., Institute of Medicine [IOM], American Medical Association [AMA], and American College of Physicians [ACP]) have supported reclassification to enhance future studies, the Schedule I status remains (Aggarwal, 2013; Cohen 2009a, 2009b, 2010; DEA Denial of Petition to Initiate Proceedings to Reschedule Marijuana, 2016). Specific dosing and recommendations concerning cannabis treatments are challenging because scientific studies concerning product variability, method of administration, effects, and side effects are lacking (Savage et al., 2016).

Traditional Pain Management and QOL

Cancer Patient

There is a relationship between pain management treatments of cancer patients and their perceptions and experiences on many different levels (i.e., physical, psychological, social, and cultural; Dalal et al., 2013). Chronic pain is often associated with physical, psychological, and social symptoms and maladies (Park et al., 2015). After a systematic review of 52 articles, researchers determined that many cancer patients commonly experience pain (i.e., cured patients [33%], in treatment [59%], and advanced-stage [64%]; van den Beuken-van Everdingen et al., 2016). Management of these chronic pain related problems are often treated pharmacologically (Park et al., 2015). According to Baek et al. (2013), for terminal cancer patients, high doses of opioids for palliative care were found to be both safe and efficient. Dalal et al. (2013) posit that cancer patients are inadequately treated for pain and more than 70% of advanced cancer patients suffer significant pain.

Cancer pain management is complex and subjective because treatments are most effective when individual perceptions and circumstances are involved in the process (Dalal et al., 2013). Chronic cancer pain can lead to functional, emotional, social, and spiritual problems for patients (van den Beuken-van Everdingen et al., 2016). Chronic pain can significantly affect cancer patient QOL for years even after treatments stop (Paice et al., 2016). Some cancer patients suffer rapid onset of intense pain lasting short durations (i.e., breakthrough cancer pain [BTCP]; Wengström et al., 2014). Uncontrolled

cancer pain can include neuropathic pain and BTCP and each patient manages these symptoms differently (Dalal et al., 2013).

Breakthrough cancer pain (BTCP) sufferers typically have a poorer medical outcome and lower satisfaction with opioid treatments (Fortner, Okon, & Portenoy, 2002). There is no standard-of-care treatment for BTCP, and patients experiencing BTCP suffer pain-related medical costs 5 times greater per year (i.e., $12,000 vice $2,400 for additional hospital, emergency department, and physician office costs) over non-BTCP suffers (Fortner et al. 2002; Haugen, Hjermstad, Hagen, Caraceni, Kaasa, & European Palliative Care Research Collaborative, 2010). Further, research is needed to evaluate patient QOL improvements with more effective analgesic treatments given the implications of BTCP on cancer patients (Fortner et al. 2002).

The majority (i.e., 70-80%) of cancer patients with advanced disease suffer moderate to severe pain (Caraceni et al., 2012). For outpatient cancer related pain management, opioids are the primary and gold standard treatment (Baek et al., 2013; Whistler, 2012). Morphine has been the first choice for treating moderate to severe cancer pain for over two decades due to “familiarity, availability, and cost rather than proven superiority” (Caraceni et al., 2012, p. e59). Various oral opioids (i.e., morphine, oxycodone, and hydromorphone) provide similar weak results as the first choice for moderate to severe cancer pain (Caraceni et al., 2012). Although various traditional pain management treatments exist, many cancer patients do not get appropriate pain relief (Caraceni et al., 2012).

Opioids

Opioids are the most abused drug for chronic pain management situations (Manchikanti et al., 2010). Opioid use over short- and long-terms has produced contradictory results. Over an 8-week study, opioid use reduced patient pain intensity significantly and improved QOL significantly (e.g., activity and sleeping; Baek et al., 2013). Although 318 participants completed this 8-week study, 168 participants dropped out due to advanced disease progression or decreased QOL due to pain (Baek et al., 2013). During other studies, opioid use increased hyperalgesia, stress, and depression (Berland & Rodgers, 2012; Cobaugh et al., 2014; Hayes & Brown, 2014), led to abuse, even for nonmedical users (Hayes & Brown, 2014), increased the need for health care, and lowered QOL (i.e., per a 10-year study; Berland & Rodgers, 2012; Jensen, Thomsen, & Højsted, 2006).

Helping patients self-evaluate pain intensity and opioid side effects in order to reduce opioid harms is a good initiative (Becker et al., 2016). Chronic pain in cancer patients affects many QOL dimensions (e.g., physical, psychological, social, and cultural; Dalal et al., 2013). While the adverse effects of opioids (e.g., negative gastrointestinal, neurological, cognitive, and hyperalgesia) affect cancer patient QOL, individualized, carefully monitored, multidimensional, and rotational opioid treatment plans could increase patient analgesia (Dalal et al., 2013). Pain management plans without complementary or alternatives to opioids may not solve the need of increasing patient QOL while decreasing the consequences of opioid side effects.

Side effects. Various types of strong opioids (i.e., oxycodone, morphine, and hydromorphone) have indicated similar analgesia and side effects when used for cancer-related pain (Baek et al., 2013). According to Dalal et al. (2013), opioids are a standard pain management treatment for cancer patients suffering moderate to severe pain because opioids do not have a pharmacology ceiling effect or direct physiological effect on the kidneys, liver, and coagulation. On the other hand, common opioid side effects include nausea, sedation, dizziness, euphoria, dysphoria, constipation, itching, pruritus, respiratory depression, sexual dysfunction, muscle rigidity, myoclonus, sleep disturbance, pyrexia, diminished psychomotor performance, and cognitive impairment (Manchikanti et al., 2010). Chronic use of opioids can cause hormonal effects, immune effects, abuse, addiction, hyperalgesia, increased medical costs, and decreased QOL (Manchikanti et al., 2010). Opioid suppression of the immune system may also increase tumor progression (Paice et al., 2016).

Despite billions of dollars spent and decades of research developing new opioid types, opioids still cause many side effects, tolerance, and dependence issues for society (Whistler, 2012). Opioid use, especially chronic use, can cause many side effects including respiratory depression (Aronoff, 2016; Baldini, et al., 2012; Perlman et al., 2013; Whistler, 2012), constipation (i.e., 40-95% occurrence rate; Kumar et al., 2014; Perlman et al., 2013), bowel obstruction, nausea, vomiting, abdominal cramping, bloating (Baldini et al., 2012), cardiovascular effects, central nervous system effects (Cobaugh et al. 2014; Baldini et al., 2012), risk of addiction, edema, pruritus, urinary retention, hyperhidrosis (Aronoff, 2016), musculoskeletal system effects, endocrine system effects,

immune system effects, sleep disorder, dizziness, increased risk of falls and fractures, depression, and impaired QOL (Baldini et al., 2012). Further, chronic pain suffers (e.g., cancer patients) often face dependence and side effect escalation issues due to opioid-related tolerance increases (Whistler, 2012).

Epidemic. Since 2000 in the United States, drug overdose death rate doubled and opioid related overdose death rate tripled when compared to 2014 (Rudd et al., 2016). In 2014, the United States had 78 people die from opioid overdose every day and 61% of all drug overdose deaths involved opioids (CDC, 2016; Rudd et al., 2016). Natural and semisynthetic opioids (e.g., opioid pain relievers, hydrocodone, and oxycodone) are related to more overdose deaths when compared to any other type of opioid (Rudd et al., 2016). Since 1999 in the United States, opioid pain reliever prescriptions and deaths related to opioid prescriptions (e.g., hydrocodone, oxycodone, and methadone) have quadrupled (CDC, 2016).

Opioid use, abuse, morbidity, and related mortality are at epidemic levels (CDC, 2012, 2016; Garcia, 2013; Rowe & Caprio, 2013). The long-term effect of opioid use is mostly negative because only the minority of patients experience benefits (Becker et al., 2016). Gastrointestinal related issues are the most frequently occurring opioid side effect (Aronoff, 2016). Other negative consequences of long-term opioid use include safety issues (e.g., mild to severe toxicities), overdose, and death (Becker et al., 2016). According to Hayes and Brown (2014), the adverse effects of opioid use make it a poor long-term option. Before prescribing opioids for pain, medical professionals should balance its effectiveness versus side effects to the QOL of patients (Baldini et al., 2012).

In the United States, the overuse and abuse of opioids are multifaceted. Fischer, Keates, Bühringer, Reimer, and Rehm (2014) identified the following factors: (a) extensive advertising promoting prescription medication use; (b) alternative and complementary medicines are given a minor role; (c) organization and delivery of medical care (i.e., time limitations, patient loads, and profit motives) incentivize prescription based interventions; and (d) patients are satisfied with prescription based medical care. Hursh, Galuska, Winger, and Woods (2005) analyzed several factors that may affect behavioral economic decisions in drug abuse situations including availability and cost of substitutes, governmental policy, and legal implications. Prescription opioid misuse was associated with increased adverse health consequences and behaviors (McCabe, West, & Boyd, 2013). Patients may continue opioids because their medical provider continues writing prescriptions not because the treatment is the most effective alternative (Becker et al., 2016**).**

Developments. New cancer pain pharmacological developments are being researched and developed which are opioid related (Caraceni et al., 2012). Frequent switches between various opioids (i.e., morphine, hydromorphone, or fentanyl) to methadone to affect dose titration and lower side effects achieved some success (Caraceni et al., 2012). Alternative opioid administration methods (e.g., transdermal, subcutaneous, epidural, intravenous, intranasal, and rectal) are also being studied to control advanced cancer pain but no standards exist (Caraceni et al., 2012). There is low quality evidence concerning effective adjuvant pain treatments for cancer patients (van den Beuken-van Everdingen et al., 2016). The traditional opioid research and methodology focus has led

to opportunities to study other pain management treatments. Research into substituting cannabis for or adjutant with opioids in pain-related cases is justified for public health reasons due to cannabis being a potentially safer mechanism of action (Lucas et al., 2015).

Conflicting evidence exists concerning the effectiveness and safety of opioids. According to Manchikanti et al. (2010), opioids seem to be ineffective for long-term noncancer pain, but they conclude that opioids are safe and effective to treat cancer pain. According to Sullivan and Howe (2013), long-term opioid use causes more demonstrated harms to patients (i.e., clinically, socially, and culturally) then benefits. Zoëga et al. (2013) identified cancer patient pain as one of top (i.e., 90%) symptoms affecting QOL.

Opioids are also unreliable in predicting the response, tolerance, or superiority for each type on every patient (Prommer & Ficek, 2012). Due to insufficient evidence, cancer patients should help tailor their pain treatments with personal preferences (van den Beuken-van Everdingen et al., 2016). Even though many cancer patients used strong doses of opioids, the common occurrence of severe pain and decreased QOL indicated under treatment and presented an opportunity for future research (Zoëga et al., 2013).

More pain management options and enhanced communication could provide solutions for cancer patients. The most effective cancer pain management decision-making included collaboration between the medical providers and patients (Dalal et al., 2013; Paice et al., 2016). Each cancer survivor has unique needs because no two cancers are the same and patients have different capabilities and experiences (Paice et al., 2016). Cancer patients need long-term pain management options that are individualized and

positively affect their QOL (Taverner, 2015). Opioids are a poor long-term option due to their adverse effects (Hayes & Brown, 2014). Due to the many problems, side effects, and complications associated with pharmacological treatments that decreased patient QOL, complementary and alternative treatments for pain management are needed (Park et al., 2015).

Nontraditional Pain Management and QOL

Complementary and Alternative Medicines

The National Center for Complementary and Integrative Health (NCCIH; 2016a) defines nonmainstream practices as complementary when used together with conventional medicine and as alternative when used in place of conventional medicine. Integrative medicine is defined by incorporation of complementary practices into mainstream practices (NCCIH, 2016a). Health care providers often focus on quantity vice QOL for cancer patients and often CAM treatments are not adequately considered (Singh & Chaturvedi, 2015). The NCCIH (2016b) includes herbs as complementary treatments but they do not recognize cannabis as an herb.

Complementary and alternative medicines (CAM) provide a challenge to practitioners providing conventional cancer treatment (Bar-Sela, Danos, Visel, Mashiach, & Mitnik, 2015). Worldwide, CAM is used by 30-40% of cancer patients yet many of these therapies do not have evidence-based assessments of interactions with conventional treatments (Bar-Sela et al., 2015). A majority of cancer patients (i.e., 83%) would incorporate CAM into cancer treatments to supplement care (e.g., help improve QOL and reduce pain) if they were part of normal protocols (Ben-Arye et al., 2014). Shneerson et

al. (2013), Bao et al. (2014), Ben-Arye et al. (2014), and Bar-Sela et al. (2015) explored CAM in cancer care and determined a relationship with expected and significant QOL improvement. Although all these researchers considered herbs in their studies, only Bao et al. (2014) included cannabis and found evidence of potential benefit for cancer pain. Further research concerning the efficacy and safety of CAM treatments are needed so medical providers can counsel patients appropriately concerning integrative cancer care options (Bauml et al., 2015).

Cannabis

Cannabis is an herb that is primarily combusted but it can be consumed in other ways (e.g., eating or drinking; Schauer, King, Bunnell, Promoff, & McAfee, 2016). Cannabis prescriptions remain relatively low because information on potential side effects and effects, insurance coverage, cost, and medical provider advocacy are lacking (Savage et al., 2016). Cannabis was used primarily for pain, sleep, and anxiety problems although further research and familiarity was needed to connect therapeutic use with risk and benefit perceptions of participants (Walsh et al., 2013). In a small, convenience, qualitative study, Peters (2013) found some participants used cannabis as an alternative or reduction agent for traditional opiate medicines. Although most participants viewed cannabis as a less effective analgesic than strong opioids, many preferred cannabis over opiates due to reduced adverse side effects and increased QOL (Peters, 2013).

In other studies, cannabis has shown significant analgesic results, but the diversity in plant strain types and concentrations and lack of FDA guidance make specific efficacy and side effect predictions difficult (Savage et al., 2016). According to Hazekamp, Ware,

Muller-Vahl, Abrams, and Grotenhermen (2013), although participants scored herbal nonpharmaceutical cannabis more satisfactorily than pharmaceutical cannabis products, patients are different and must find the right dose and application method for their situations. Further, there is a need to compare cannabis with the traditional pharmaceutical treatments (Walsh et al., 2013).

For chronic pain participants, medical cannabis use significantly decreased opioid use (i.e., by 64%), decreased side effects, and improved QOL (i.e., by 45%; Boehnke et al., 2016). Boehnke et al. (2016) opine the benefits of marijuana use may represent the synergistic effects between cannabis and opioids or the greater potential marijuana may hold over other classes of medications to reduce chronic pain. Degenhardt et al. (2015) found cannabis use in chronic noncancer pain patients reported greater pain relief with adjuvant opioid use vice opioids used without cannabis. Hoggart et al., (2015) found the benefits of using an adjutant THC/CBD spray for neuropathic pain seemed to outweigh the risks for many patients. Morley, Cao, and Shum (2016) consider cannabis use during palliative and end-of-life care to decrease pain and enhance QOL of patients. These identified relationships need further research (Boehnke et al., 2016; Haroutounian et al., 2016).

Side effects. Many studies have been conducted concerning the effects of marijuana and the results are mixed. Some studies indicated that marijuana might pose risks of addiction, adolescent brain development, mental illness, anxiety, life performance deficiencies, increased motor vehicle accidents, respiratory symptoms, and cancer (Hill, 2015; Volkow, Baler, Compton, & Weiss, 2014). In a long-term neuropathic pain study

with a THC/CDB spray, 59% of participants experienced at least one mild or moderate adverse event (e.g., dizziness [19%] and nausea, dry mouth, taste issue, fatigue, and intoxication [all <10%] that was treatment related; Hoggart et al., 2015). Due to political and legal limitations set by Schedule I drug status, many marijuana researchers have been hampered or excluded from participating in established drug testing protocols and processes (Bostwick, 2012; Cohen, 2009a, 2009b, 2010). Given these negative finding, some researchers have discovered conflicting evidence and potential positive aspects of marijuana use.

Cannabis use for chronic pain has shown increased risk of nonserious adverse events (e.g., nausea, dizziness, drowsiness, headache, and nasopharyngitis) but no difference in risk of serious adverse events were indicated (Ware et al., 2015). Although cannabis has been associated with various negative side effects (e.g., nausea, dizziness, headache, heart rate, auditory, verbal, visual, and memory), its use in chronic pain situations to potentially increase patient QOL while decreasing opioid use needs further study (Haroutounian et al., 2016). Further, long-term side effects of cannabis medical use have yet to be fully studied (Haroutounian et al., 2016; Ware et al., 2015).

In 71% of 38 published randomized controlled studies, cannabinoid use was associated with nonserious side effects, good tolerance, and statistically significant pain relief (Aggarwal, 2013). Tripp et al. (2014) reported exploratory evidence that the majority of their chronic pelvic pain syndrome participants used cannabis and had improved pain, mood, muscle spasms, and sleep with no increase in side effects. Zaller et al. (2015) studied 200 medial cannabis users and found chronic pain management,

improved pain relief, and opioid alternative as the predominant reasons for cannabis use. In a short-term study, Ware et al. (2010) found herbal cannabis reduced the intensity of pain and improved sleep without significant side effects. In a 1-year study, Ware et al. (2015), found cannabis improved pain, function, and QOL of participants while an increased risk of mild to moderate nonserious adverse events was noted.

Cannabis treatments have both health risks and benefits (Hill, 2015). Two-dozen high-quality studies indicated positive results in treating neuropathic pain, chronic pain, and spasticity due to multiple sclerosis using medical marijuana (Hill, 2015). In 38 randomized controlled trials published between 1978 and 2010 that evaluated the pain-relieving properties of cannabis, 27 (71%) concluded pain-relieving effects and 11 (29%) did not (Aggarwal, 2013). Nineteen cannabis treatment studies for chronic pain, between 1975 and 2008, were examined and evidence of efficacy was determined (Martín-Sánchez Furukawa, Taylor, & Martin, 2009). During the course of cannabis treatment for chronic pain, several significant side effects resulted (e.g., euphoria, blurred vision, confusion, speech disorder, muscle twitching, impaired memory, and numbness) which may offset the potential benefits of using cannabis (Martín-Sánchez et al., 2009). In a long-term study using a THC/CBD spray for cancer-related pain, the primary side effects included dry mouth, dizziness, nausea, vomiting, sleepiness, and confusion (Johnson et al., 2013).

In 31 research studies (i.e., 23 randomized controlled trials and 8 observational studies) on cannabis-related medications, there was no evidence of a higher rate of serious side effects for participants when compared to control groups (Aggarwal, 2013).

The majority (i.e., 96.6%) of adverse side effects related to the cannabis-related medications were nonserious (Aggarwal, 2013). These nonserious side effects included dizziness (15.5%), drowsiness (8.2%), muscle spasm (6.3%), gastrointestinal problem (6.2%), pain (6.0%), dry mouth (5.2%), and bladder disorder (4.8%; Aggarwal, 2013). Although there was an increase in the risk of nonserious side effects in the cannabis-related groups, these effects were modest and tolerated (Aggarwal, 2013). Wilsey et al. (2013) found psychoactive effects of vaporized cannabis treatments (i.e., low and medium strength THC) were minimal, reversible, and well tolerated. Other researchers suggested that marijuana use might result in alleviation of some clinical symptoms for bipolar patients without additional cognitive impairment (Sagar et al., 2016). Cohen, Heinz, Ilgen, and Bonn-Miller (2016) suggested that future pain management studies should compare the efficacy and side effects of cannabis to opioids.

According to the IOM, negative effects of cannabis, except those associated with smoking, are within a normal range tolerated for similar medications (Joy, Watson, & Benson, 1999). Pletcher et al. (2012) found occasional use of smoked cannabis was not associated with adverse pulmonary function. Use of marijuana (i.e., up to 20 years for participants aged 18 to 38) was associated with periodontal disease but was not associated with lung, systemic inflammation, and metabolic health problems (Meier et al., 2016). Tobacco use within the same participant pool (i.e., 1,037 total participants from New Zealand South Island) was associated with worse lung, systemic inflammation, and metabolic health problems (Meier et al., 2016). The IOM recommended further research using cannabis and developing other safe and reliable delivery mechanisms

although for certain patients, such as terminally ill, the long-term risks of smoking were not a great concern (Joy et al., 1999).

Barriers. According to Penington (2015), patients should be able to use cannabis to seek relief given proper medical recommendation and following state laws. Several barriers have prevented research and medical acceptance of marijuana. These barriers include the following: (a) political hesitancy and nonacceptance, (b) practitioner educational and training deficiencies, (c) patient-practitioner communication breakdown, and (d) practitioner concern over opioid abuse and hesitancy to advocate marijuana (Carter et al., 2015).

There are only a few approved cannabinoid-related prescription medications on the market (i.e., dronabinol [Marinol®; synthetic THC], nabilone [Cesamet®; synthetic molecule similar to THC], and nabiximols [Sativex®; THC and CBD extract]; Savage et al., 2016). The small number of cannabis treatment options available are most likely due to the lack of clinical research, cost issues, inconsistent insurance coverage, little to no standardization or guidance in use, and medical professional reluctance to support (Savage et al., 2016). Medical professionals who have patients using cannabis for pain or other symptoms should educate themselves on existing cannabis research and monitor the side effects, symptoms, and impending effects on the QOL of their patients (Savage et al., 2016).

The controversy concerning cannabis use for chronic and cancer pain is multifaceted. In Canada, despite being a legal option, marijuana was often not prescribed for chronic noncancer pain due to the uncomfortableness of medical providers in using

cannabis as a pain management option (i.e., only 23% prescribed; St-Amant, Ware, Julien, & Lacasse, 2015). Opioids are one of the most commonly used medications for palliative pain but may be inappropriate for chronic noncancer pain because short-term vice long-term effectiveness and efficacy have been indicated (Manchikanti et al., 2010). Although concrete evidence concerning opioid safety and effectiveness in the treatment of chronic pain is inconclusive, opioids remain a reasonable and primary treatment option (Manchikanti et al., 2010). Ineffective long-term efficacy of opioids would seem to open up opportunities to find solutions for the long-term pain management care and QOL enhancement for both noncancer and cancer patients.

Some medical professionals have prescribed cannabis for pain and other symptoms. Aggarwal et al. (2013) conducted research and determined that medical marijuana was prescribed for intractable pain for 25% of their participants while over 25% of the participants listed reduction of five different types of pain (i.e., musculoskeletal [51.4%]; neurological [45.7%]; head, ears, eyes, nose, and throat [37.1%]; dermatological [31.4%]; and abdominal [25.7%]). Other symptoms found to be reduced or improved through use of medical marijuana which all improved QOL included the following: Reduced anxiety (71.4%), improved mood (68.6%), reduced nausea (65.7%), stimulated appetite (54.3%), reduced respiratory pain (20.0%), reduced genitourinary pain (17.1%), reduced chest pain (8.6%), and reduced breast pain (5.7%; Aggarwal et al., 2013). Researchers continue to examine the evidence concerning cannabis, opioids, and patient QOL.

Carter et al. (2015) presented evidence that marijuana could be a safer substitute or complementary treatment to address the growing medical concern over the opioid epidemic. Due to the mechanism of action of cannabis, it has no known lethal dose (Savage et al., 2016). Use of cannabis-based medicines to substitute or complement opiate-based medicines for pain could possibly save thousands of lives (Carter et al., 2015). Cannabis could be used to reduce patient pain while reducing use of opioids (Kral et al., 2015). Concerning neuropathic pain, Collen (2012) opines cannabis should often be considered the first choice treatment option over opioids as an effective harm reduction strategy. The lethality problem of opioids combined with political and societal ideology against cannabis often trumps emerging scientific evidence and affects cannabis-based medicines from being prescribed for pain (Carter et al., 2015). Some researchers have indicated medical marijuana legal states have improved associations related to opioid mortality statistics.

Legislation. States with medical marijuana laws have shown decreases in some opioid related mortality statistics. Researchers analyzed Fatality Analysis Reporting System (FARS) data (i.e., 1999–2013) from 18 states and found a significant association between U.S. states with marijuana laws and reductions in opioid related fatal driving incidents for 21-40 year-olds who died within 1 hour (Kim et al., 2016). Between 1999 and 2010, U.S. states with medical marijuana laws had a 25% lower mean annual rate of opioid overdose and mortality than states without such laws (Bachhuber et al., 2014; Hayes & Brown, 2014). Researchers have speculated a general relationship between medical marijuana laws and opioid analgesic related overdose deaths that strengthened

over time: Through year 6 after law implementation, mortality rates decreased (Bachhuber et al., 2014). Finney, Humphreys, and Harries (2015) opine that general state-level data need refinement with individual level analysis concerning patients' pain treatment of choice (e.g., marijuana, opioid) and other detailed information. Powell, Pacula, and Jacobson (2015) found consistent evidence that states with medical marijuana laws and provided sales through dispensaries had lower pain medicine addiction admissions and opioid overdose deaths.

Concerning integrative cancer care options, increased research into the efficacy and safety of CAM treatments is needed (Bauml et al., 2015). Cannabis has shown significant analgesic results, but substance variations and lack of standardizations make efficacy and safety predictions difficult (Savage et al., 2016). During a 1-year study, Ware et al. (2015) found cannabis improved pain, function, and QOL of participants while an increased risk of mild to moderate nonserious adverse events was noted. There is a need to compare cannabis with the traditional pharmaceutical treatments (Walsh et al., 2013). Other researchers suggest future pain management studies should compare the efficacy and side effects of cannabis to opioids (Cohen et al., 2016).

Opioid and Cannabis Use on QOL

Researchers indicated chronic pain patients being treated for opioids encountered more use problems than those treated with medical marijuana (Feingold et al., 2016). Symptoms of high levels of pain may suggest the greater problematic use of opioids over cannabis, and opioid induced hyperalgesia may contribute to increased levels of perceived pain (Feingold et al., 2016). Between 2010 and 2013, Bradford and Bradford

(2016) found the use of prescription drugs for pain declined significantly (i.e., 1,826 daily doses per physician per year) for Medicare Part D enrollees in states where medical marijuana was a clinical alternative. Temple (2016) cited similarities between cannabinoid and opioid receptors in the nervous system that may explain preclinical data concerning the synergistic effect between the two substances.

Currently, few studies have examined the efficacy of cannabis as an adjunct therapy in order to reduce opioid treatments (Meng et al., 2016). Zaller et al. (2015) found that 55.5% of their 200 participants indicated substituting cannabis for prescription medications, 85% of chronic pain suffers reported improved pain profile, and 91.5% reported fewer unwanted side effects with cannabis use over prescriptions. Meng et al. (2016) found adjunct cannabis treatment helped wean a patient with a 4-year, multifaceted chronic pain problem and recent postoperative pain from high opioid consumption and dependence. As a result, total opioid consumption was reduced from 30 mg to 6 mg a day and opioid side effect reduction enabled the patient to resume work (Meng et al., 2016). More studies concerning opioids, cannabis, and the adjunct role of cannabis and opioids concerning noncancer pain are needed (Degenhardt et al., 2015; Meng et al., 2016).

Narang et al. (2008) conducted phase 1 and 2 trials that compared chronic noncancer pain treatments (i.e., exclusive opioid therapy to opioid therapy with synthetic THC [i.e., dronabinol aka Marinol ®] added). The dronabinol/opiate therapy significantly increased QOL and decreased pain intensity compared to the opiate therapy without dronabinol (Narang et al., 2008). The dronabinol/opiate therapy produced mild to

moderate negative (e.g., dry mouth and drowsiness) and positive (e.g., sleep quality) side effects while participants were overall satisfied with the treatment (Narang et al., 2008). Dronabinol may be a useful adjuvant treatment with opioids for chronic pain patients (Narang et al., 2008).

In a 5-week study, 263 advanced cancer participants, with previous poor opioid analgesic response, experienced significant decrease in average pain criteria with adjuvant use of low and medium doses of a THC/CDB oromucosal spray (i.e., Sativex®; (Portenoy et al., 2012). Johnson et al. (2013) indicated a reduction in pain levels in a small sample of advanced cancer patients over the long-term using level doses of a THC/CBD oromucosal spray. Pain of the terminal participant base (i.e., 43 in total) had not been fully relieved by use of strong opioids alone (Johnson et al., 2013). Participants also had improvements of sleep outcomes throughout the THC/CBD complementary treatment period without increases in safety concerns (Johnson et al., 2013). Paice et al. (2016) do not recommend cannabis as a first-line pain treatment for cancer survivors, but they suggest evidence warrants consideration of cannabis as an adjuvant treatment in accordance with state laws.

There is evidence of successful adjuvant use of cannabis for pain in some research. Haroutounian et al. (2016) suggested that adjuvant cannabis therapy for 206 participants suffering chronic pain (i.e., 93% noncancer related) resulted in significant decreased opioid use (i.e., 73 opioid using participants reduced by 44%) and improved patient pain, functional outcome, and QOL measures with low incidence of adverse effects over the long-term. Ware et al. (2010) reported cannabis improved participant

mood, pain, and sleep outcomes without significant side effects. The overall well being of patients was improved with cannabis when previous conventional pain management therapies had failed (Ware et al., 2010).

Several studies have been conducted concerning advanced cancer pain, opioids, and adjuvant use of various cannabinoid oromucosal formulations (Johnson et al., 2013; Portenoy et al., 2012). A THC/CBD oromucosal spray (i.e., Sativex®) was investigated in both short- and long-term studies for both noncancer and cancer pain (Hoggart et al., 2015; Johnson et al., 2013; Portenoy et al., 2012; Serpell et al., 2014). In a 15-week study, 173 treatment-resistant, randomized participants suffering peripheral neuropathic pain indicated improvements in pain and had significant improvements in sleep and QOL with adjunct use of the THC/CBD spray (Serpell et al., 2014). In a 38-week study, Hoggart et al. (2015) indicated a significant improvement in peripheral neuropathic pain for 234 participants using an adjunct THC/CBD spray while continuing traditional pain therapy. Researchers observed the neuropathic pain improvements throughout the 38-week study period without tolerance issues while the majority of adverse events were mild or moderate (Hoggart et al., 2015).

The substitution of cannabis for prescription drugs occurred in 80.3% of participants and the highest rated reason for conversion was pain-related conditions (Lucas et al., 2015). Cannabis has indicated lower dependence risk, fewer side effects, and no fatal dose possibility when compared with opioid medications (Lucas, 2012). For chronic pain participants, cannabis reset opiate analgesia, decreased opiate dosage, and reduced pain levels experienced (Lucas, 2012). Abrams, Couey, Shade, Kelly, and

Benowitz (2011) found pain treatments of cannabis used in conjunction with opioids significantly decreased pain without reducing plasma opioid levels. Wilsey et al. (2013) found vaporized cannabis (i.e., low and medium dose THC) may be an effective treatment for neuropathic pain disorders. In the first 3 months of a longitudinal, pilot study, Gruber et al. (2016) indicated no cognitive executive functioning deficits, some improved cognitive function, positive changes in QOL, and 42% decrease in opiate use among 24 regular, recreational marijuana users. Because evidence suggests cannabis could be a safer alternative to or complement with opioids, further research is warranted (Lucas, 2012; Lucas et al., 2015).

There is an ethical mandate to relieve cancer patient pain (Sullivan & Howe, 2013). Management of pain and improving cancer patient QOL is a main goal of cancer care (Zoëga et al., 2013). Adjuvant treatments to complement or replace opioid treatments to control pain and improve QOL during end of life care are a primary concern (Prommer & Ficek, 2012). According to Caraceni et al. (2012), over 70% of cancer patients with advanced disease suffer moderate to severe pain and many do not receive appropriate pain relief. Opioids are the traditional and gold standard treatment for cancer pain management (Baek et al., 2013; Whistler, 2012). Prommer and Fick (2012) included cannabis to the list of available adjuvant analgesics to complement opioids for end of life care. According to Abrams (2016), some terminal cancer patients have added cannabis to reduce high opioid-based therapies and increase communication with loved ones. If long-term opioid treatments fail to improve patient pain, function, and QOL, then other methods must be pursued (Sullivan & Howe, 2013).

Patient Perspective Concerning Dosing

Cannabis dosing mechanisms and strain types are two variables that need further research. There is a lack of data concerning various cannabis use mechanisms (e.g., smoked, ingested, vaporized; Bowles, O'Bryant, Camidge, & Jimeno, 2012; Schauer et al., 2016) and conventional versus unconventional pain medications concerning cancer-related non-neuropathic or neuropathic pain (Bowles et al., 2012). Cannabis strains differ in potency of THC and CBD levels, so fine-tuning the right treatment for specific situations can be very individualized (Savage et al., 2016). High-THC cannabis strains were associated with physical and mental side effects while high-CBD strains had less mental side effects while associated with various types of pain relief (Savage et al., 2016). Research concerning the amounts of THC and/or CBD to use for pain treatments is also needed.

Johnson et al. (2013) indicated in a small sample that a cannabis extract of 1:1 THC and CDB was more effective than an extract of THC alone in relieving long-term cancer patient pain. High CDB derivatives are often more effective than THC derivatives concerning analgesia (Abrams, 2016). Meng et al. (2016) found a medical cannabis user was able to adjust the strains used (i.e., various THC and CBD concentrations) for different purposes (e.g., nausea or analgesia). As clinical studies are conducted, the body of knowledge concerning various cannabis-related strains and products should become more refined and effective (Savage et al., 2016).

Birdsall, Birdsall, and Tims (2016) cite the need for better quality control, efficacy testing, and regulation of cannabis because over 75% of states have laws

allowing full (i.e., THC and CBD) or partial (i.e., CBD only) medical use. There are many cannabis strains that are grown without regulatory compliance, and each strain may contain various potencies of cannabinoids (e.g., THC and CDB; Thomas & Pollard, 2016). All the various cannabis strains fall into three different categories (i.e., sativa, indica, and hybrids; Cohen et al., 2016). Cohen et al. (2016) found chronic pain patients typically use indica strains over sativa and had less cannabis use problems than nonchronic pain users. Pearce, Mitsouras, and Irizarry (2014) observed a similar significant preference for indica strains among chronic pain sufferers. Chronic pain is a qualifying medical condition to use cannabis in medically legal states and patients seem likely to use most effective cannabis strain for their pain (Cohen et al., 2016).

Although medical use of marijuana in low doses does not seem to cause harm, heavy use, especially when combined with tobacco, has indicated the potential for respiratory harm (Joshi, Joshi, & Bartter, 2014). Because cannabinoid receptors are not on the brain stem, cannabis side effects do not include respiratory depression leading to death, which is a classic and common side effect of opioid overdose (Lucas, 2012). Researchers determined no causal association between long-term marijuana use and development of head and neck cancer (de Carvalho et al., 2015). Other evidence suggests that marijuana may have efficacy in the treatment of other cancer side effects (e.g., nausea and appetite stimulation; Abrams, 2016) and cancer itself (Abrams, 2016; Joshi et al., 2014). Therefore, noncombustible forms of marijuana could be a perceived and potential societal benefit for cancer patients (Abrams, 2016; Joshi et al., 2014).

Sufficient evidence exists concerning the effectiveness of cannabis for pain to warrant further research of plant variety and administration choice on acute and chronic conditions (Zaller et al., 2015). Besides recent Sativex® studies, research using noncombustible forms of marijuana have been limited to some small-scaled studies. Martellucci et al. (2015) collected efficacy data on 18 cancer patients in Italy and found infusions of cannabis seemed to help control emesis and improve QOL but seemed insufficient at reducing pain.

Similar to opiate use strategies for pain management, cannabis use offers many possibilities. Given medical provider guidance, the personal preferences of cancer patients should be a vital factor in determining the right pain management plan (van den Beuken-van Everdingen et al., 2016). There are many cannabis varieties and ways to intake the substance, so patients must find the right dose for their condition and circumstances (Hazekamp et al., 2013). According to Paice et al. (2016), each cancer survivor has unique needs because no two cancers are the same and patients have different capabilities and experiences. Even the gender of a patient may affect this individualized pain management plan.

Gender and Pain Treatment

The most commonly used illicit drug is marijuana (Manchikanti et al., 2010). Women seem to be using marijuana at an increasing rate and seem to indicate more addictive tendencies than men (e.g., higher abuse, dependence, relapse, and severe withdrawal symptoms; Craft et al., 2013). Evidence indicates that ovarian hormones alter the effects of cannabinoid sensitivity between post-adolescent gender participants (Craft

et al., 2013). Women were also found to use additional drugs to enhance the effect of opioids but less than 3% of participants stated use of marijuana (Back et al., 2009). Other studies indicate mixed results concerning use and abuse of both opioids and marijuana when gender is considered (Greenfield et al., 2010).

Individuals often view the same barrier or benefit in different ways. Das and Evans (2014) discovered that gender consideration when examining the components of HBM could give researchers new intervention alternatives. Gender perspective identification and interpretation often provide an additional dimension to consider in some studies (Das & Evans, 2014). Pearce et al. (2014) expressed a need for researchers to compare the efficacy of various cannabis types by gender.

Differences in gender provided a research opportunity because rates and effects of marijuana use have produced conflicting evidence for researchers. When gender and drug use were compared, males dominate illicit drug (i.e., 9.9% vs. 6.3%) and marijuana (i.e., 7.9% vs. 4.4%) categories, while both genders had similar rates of psychotherapeutic drug (i.e., 2.6% vs. 2.4%) and pain reliever (i.e., 2.0% vs. 1.8%) use (Manchikanti et al., 2010). Ryan-Ibarra et al. (2015) determined that men and woman in California used medical marijuana at a similar rate (i.e., 6% vs. 5%).

Despite an apparent equal use of medical marijuana, research indicated that men and women do not respond equally to its effects (Craft et al., 2013). According to Cooper and Haney (2016), male cannabis smokers exhibited greater analgesia when compared to women cannabis smokers. Lenz et al. (2011) noted a hyperalgesia in similar testing methodology (i.e., cold-pressor test) using opioid medications although all participants

were male. These identified relationships concerning gender, pain sensitivity, and pain management treatments warrant further investigation (Cooper & Haney, 2016; Lenz et al., 2011). Although illicit and legal marijuana use may be an influencer affecting usage, for my study, gender was included as a modulating factor.

Summary and Conclusions

Both opioid and cannabis prescription and/or use for pain should focus on side effects, physical function, symptom management, possible addiction, and QOL of patients (Savage et al., 2016). Cannabis treatments have been modestly effective and safe treatments in chronic pain patients, but most studies have focused on noncancer pain vice cancer-related pain (Aggarwal, 2013). More high quality, large sample size, long-term exposure, and analgesic comparative assessments concerning pain relief and physical functioning are needed (Aggarwal, 2013; Degenhardt et al., 2015; Kahan, 2014).

Cannabis may be an effective pain treatment to reduce opioid abuse and overdose (Boehnke et al., 2016). Because cannabinoid receptors are not on the brain stem, cannabinoid-based drugs may have an advantage over opioid-based drugs concerning overdose potential (Lucas, 2012). The growing rates of opiate addiction, abuse, and mortality are public health concerns with significant social costs (CDC, 2016; Lucas, 2012; Rudd et al., 2016). Wilsey et al. (2013) demonstrated that low-dose (i.e., 1.29% THC), vaporized cannabis had a favorable risk-benefit ratio in the treatment of neuropathic pain in some patients. Future studies could examine cannabis concerning pain and side effects relief to better understand the analgesic effects and implications (Wilsey et al., 2013).

Many medical clinicians, researchers, and leaders agree that opportunities exist concerning the potential use of cannabis for pain (Savage et al., 2016). Patients with cancer-related pain may benefit from using cannabis and opioids complementarily (Johnson et al., 2013; Kral et al., 2015). In a short-term study, cannabis used in conjunction with opioids significantly reduced pain in participants, which may lower opioid doses and related side effects (Abrams et al., 2011). Cannabis could be a safe and effective treatment for chronic pain and serve as an alternative or complementary treatment to relieve society from the growing costs related to the opioid epidemic (Lucas, 2012). Bowles et al. (2012) and van den Beuken-van Everdingen et al. (2016) noted a lack of data concerning various cannabis and conventional pain medications concerning cancer-related pain.

There are some studies indicating success with adjuvant cannabis use and cancer pain but further research is needed. Significant improvements in pain were indicated in short and long-term studies related to cancer pain when using the THC/CBD spray (i.e., Sativex®; Johnson et al., 2013; Portenoy et al., 2012). In a small sample of advanced cancer patients over a long-term period, level doses of a cannabis extract reduced the pain of participants when use of strong opioids alone had failed (Johnson et al., 2013). Further, participants displayed improvements in sleep outcomes throughout the complementary treatment period, and the cannabis treatment was well tolerated without increased safety concerns (Johnson et al., 2013). Because evidence suggests cannabis could be a safer alternative to or complement with opioids, further research is warranted (Boehnke et al.,

2016; Carter et al., 2015; Haroutounian et al., 2016; Joshi et al., 2014; Lucas, 2012; Lucas et al., 2015).

Cohen et al. (2016) suggested comparing the efficacy and side effects of cannabis to opioids in future pain management studies. Many clinical studies have been accomplished concerning opioid administration and noncancer and cancer pain management. Some studies have been accomplished concerning cannabinoid products, noncancer pain, cancer pain, and related QOL for patients. The gap in current literature concerns use of opioids and/or cannabinoids for pain management and the relationship to the QOL of cancer patients. Given further research and similar findings, medical marijuana legislation could become part of a comprehensive effort to reduce the ramifications of the opioid epidemic affecting society (Bachhuber et al., 2014).

There are many cannabis varieties and ways to intake the substance, so patients must find the right dose for their condition and circumstances (Hazekamp et al., 2013). According to Paice et al. (2016), each cancer survivor has unique needs because no two cancers are the same and patients have different capabilities and experiences. Concerning the optimal pain management treatment for cancer pain, the personal situation and preference of patients should be primary factors (van den Beuken-van Everdingen et al., 2016). The present study incorporated the pain management preferences of cancer patients and their related QOL.

In Chapter 2, I reviewed a breadth and depth of studies related to cannabis, opioids, pain management, and QOL related to cancer patients. In Chapter 3, I will describe the research design and rationale, methodology, population, sampling

procedures, data collection, instrumentation, threats to validity, and ethical procedures in detail.

Chapter 3: Research Method

Introduction

The purpose of the causal–comparative research was to determine the effects different types of cancer pain management treatments may have on the QOL of cancer patients. The study involved elements of the HBM (Hochbaum et al., 1952) using an existing validated and reliable instrument (i.e., WHOQOL-BREF) measuring the dependent variable, QOL (Skevington et al., 2004; WHOQOL Group, 1996). Pain management is an essential determinant of patient outcomes because unrelieved pain significantly comprised patient QOL and effective pain management was associated with patient survival (Mendes, Boaventura, Castro, & Oliveira Mendonça, 2014; Perlman et al., 2013).

Pain is a secondary health problem that many cancer patients suffer which may relate to their QOL (Shneerson et al., 2013). Even with strong doses of opioids, many cancer patients are still undertreated and encounter severe pain, which impacts their QOL (Nerseyan & Slavin, 2007; Tanco et al., 2014; Zoëga et al., 2013). Zaller et al. (2015) studied 200 medial cannabis users and found chronic pain management, improved pain relief, and opioid alternative as the predominant reasons for cannabis use. Johnson et al. (2013) indicated a reduction in pain levels in a small sample of advanced cancer patients over the long-term while level doses of an adjuvant THC/CBD oromucosal spray was used. My research focused on nontraditional (i.e., cannabis) and/or traditional pain management (i.e., opioids) treatments and their relationship to the QOL of cancer patients.

In this chapter, I review the details of the causal–comparative research study. Key areas include the research design and rationale, methodology, sampling, recruitment, participation, data collection, threats to validity, and ethical procedures.

Research Design and Rationale

The quantitative nonexperimental research design included causal-comparative design, descriptive statistics, and cross-sectional survey data. Questionnaires were distributed through SurveyMonkey to collect data from cancer patients. Causal–comparative does not seek cause and effect relationships because data are collected through environmental course and not experimental design (Field, 2013). This approach provided the method to assess the difference between participant dependent variable (i.e., QOL as measured by the WHOQOL-BREF), the independent variable (i.e., cancer pain management choice [opioids and/or cannabis]), and a moderator (i.e., gender). The research variables, as related to the specific participants, were analyzed using ANOVA and inferential statistics (Creswell, 2009). Data were gathered at a specific time rather than over multiple time periods to reduce the effects that time might have on QOL (Creswell, 2009; Field, 2013).

Quantitative research uses instruments and "processes of measurement, counting, association, and causality" to identify characteristics of social phenomena (Frankfort-Nachmias & Nachmias, 2015, p. 242). Researchers use collected data and statistical procedures to identify relationships and deductively test the research questions, which are derived from theory (Creswell, 2009; Frankfort-Nachmias & Nachmias, 2015). The QOL of a participant is a measured numeric value representing a present truth. The relationship

between pain management and QOL is assumed to be objective and externally observable vice subjective (Jean-Lee, 1992). Researchers using positivism attempt to study parts of the whole situation by uncovering causal relationships to understand the world (Jean-Lee, 1992). Positivist researchers provide unbiased reports of empirical findings and descriptions of the observed reality (Wicks & Freeman, 1998). My research took the positivist perspective through survey methodology, data collection, and analysis to reveal the relationships between relevant variables. Because HBM originators established a relationship between the health perceptions and behaviors of individuals (Hochbaum et al., 1952; Rosenstock, 1974), a quantitative design was used. More information is needed to broaden categories of health attitudes, chronic disease, and health access to promote the health of cancer patients (Venters & Gany, 2011).

The causal comparative, ex post facto design was used to enhance the study. In social science research, ex post facto research can be used to test a hypothesis concerning possible correlations when experimentation on participants is not appropriate (Simon & Goes, 2013). Because independent variables are not manipulated and participants are not randomly assigned to groups, the causal comparative design enables comparisons defined by biological factors (i.e., gender) to uncover correlational characteristics of the dependent variable (i.e., QOL; Simon & Goes, 2013). Because a validated and reliable survey was used to collect data (i.e., WHOQOL-BREF; Skevington et al., 2004), the corresponding numerical values provided opportunity for multivariate comparisons and analysis (WHO, 1997b; WHOQOL Group, 1996).

Cannabis could be a safer alternative to or complement with opioids concerning analgesic effects, but further research is warranted (Boehnke et al., 2016; Carter et al., 2015; Haroutounian et al., 2016; Joshi et al., 2014; Lucas, 2012; Lucas et al., 2015). Zoëga et al. (2013) used a convenience sample of 150 participants, who were 18 years or older and had a diagnosis of cancer, in their cross-sectional, descriptive, and correlational study on opioid use and QOL. The WHOQOL-BREF is a 26-item survey that was used to determine the difference in the QOL of cancer patients, between types of cancer pain management therapy (i.e., traditional prescription based therapy [e.g., opioids], nontraditional based therapy [e.g., cannabis], and combined traditional and nontraditional therapy). Additionally, the gender (i.e., male and female) of each cancer patient was examined to determine if it affects the relationship between pain management therapy and QOL. Because cancer patients are inadequately treated for pain and more than 70% of advanced cancer patients suffer significant pain (Dalal et al., 2013), this societal issue and gap in literature needed further investigation.

Methodology

Population

The number of annual cancer cases worldwide will reach over 20 million in the next 15 years while pain management and QOL for cancer patients remain a primary concern to health providers and affected patients (Kwon et al., 2013; Pelayo-Alvarez et al., 2013; WHO, 2015). In the United States, nearly 14.5 million Americans were alive with a previous history of cancer (i.e., as of January 1, 2014); in 2016, nearly 1.7 million Americans will be diagnosed with a new cancer (i.e., aforementioned data do not include

many noninvasive or squamous cell skin cancers); and in 2016, nearly 600,000 cancer related deaths are expected (American Cancer Society, 2016). For this research, the study population consisted of individuals who have been formally diagnosed with cancer, were at least 18 years of age, read English, have suffered from chronic pain, and may or may not be undergoing treatment.

Participants included male and female patients of all ethnicities with no filtering by socio-economic status or educational achievement. Because responders not part of the target population have the potential to invalidate web-based surveys through unsolicited participation (Rudestam & Newton, 2015), several control measures were taken. These control steps included the following: (a) precollaboration with participant pool providers (e.g., medical providers, associations, support networks, and/or online forums); (b) used marketing flyer to attract appropriate participants; (c) obtained digital informed consent prior to participant data collection; (d) obtained organizational data use and contact permission letters, as appropriate; and (e) used anonymous survey methods (Walden University, 2016).

Sampling and Sampling Procedures

Both convenience and purposive sampling technique were used to extract the sample from the population. Social scientists use nonprobability sampling under certain circumstances: (a) when a sampling population cannot be properly defined, (b) when a sampling population list is unavailable, (c) for exploratory research, and (d) when convenience and economy outweigh any advantages of using probability sampling

(Frankfort-Nachmias & Nachmias, 2014). For this research study, all of the previous factors could be applied.

There are four major designs that use nonprobability samples (i.e., convenience, snowball, purposive, and quota), and I used a combination of convenience with purposive when selecting sample participants for this research (Frankfort-Nachmias & Nachmias, 2014). Snowball sampling was not appropriate because anonymous techniques were used and the applicable target sample was reached through regular survey measures. Quota sampling was not appropriate because breakdowns of inclusion criteria were not known or relevant to the study. Convenience samples use whatever sampling units are available, and purposive sampling encompasses selecting participants that are readily available to be researched, meet specific inclusion criteria, and appear to represent the population (Frankfort-Nachmias & Nachmias, 2014; Merriam, 1998). These last two sampling types can be used when time, funding, and location and availability of inclusion participants are restricted (Merriam, 1998).

Purposive sampling is an extension of convenience sampling and is commonly used during nonprobability sampling when researchers are confident the data collected will represent the study population (Frankfort-Nachmias & Nachmias, 2014; StatPac, 2014). These techniques are often used during preliminary research to get estimates of results "without incurring the cost or time required to select a random sample" (StatPac, 2014, para. 8). Because "most social science studies are not based on representative samples" (Ellis, 1994, p. 171), this sampling method enabled action within a limited period of time and under specific conditions that facilitated data collection. Due to these

factors, purposive sampling sacrifices some degree of generalizability and results may not provide sufficient representation of the target population; however, the research design choice is better than not conducting the research (Ellis, 1994; Frankfort-Nachmias & Nachmias, 2014).

The results may only partially represent the population under investigation, and replication may be required to fully validate the results (Keppel & Zedeck, 2001). Despite these limitations, purposive sampling is the best design to obtain participants to represent the research population when time, resources, and conditions prohibit random sampling (StatPac, 2014). Use of purposive sampling allowed a search for an approximate truth when obtaining a probability random sampling was prohibitive.

A power analysis using G*Power 3.1 statistical software was conducted to determine the required sample size for the ANOVA analysis (Field, 2013). Determining the optimal sample size prior to research execution can maximize statistical power and minimize sampling costs (Liu, 2014). When conducting research, an a priori power analysis is often necessary (Cohen, 1992). An important component of power analysis is the effect size. An effect size can be estimated from a pilot study, prior research, or theory (Cohen, 1992). Because no specific research or theory exists on the given research topic, a medium effect size, as defined by Cohen (1992), will be used.

G*Power 3.1 uses Cohen's f as an effect size measure for ANOVA analysis. Within G*Power, Cohen's f was set to its medium effect size value of .25 (Cohen, 1992). The desired power for the analysis was set to the conventional level of .80, and

the significance (i.e., alpha) level was set to the conventional .05. The ANOVA model tested included three groups (i.e., traditional prescription based therapy, nontraditional based therapy, and traditional and nontraditional therapy); therefore, the number of groups was set to three. The overall significance of the model was tested with an *F*-Ratio; therefore, the test family setting in G*Power was *F*-tests. Because the analysis was conducted in advance of the actual study, the type of power analysis was set to a priori. Using these parameters and analysis settings, the estimated minimum sample size for the study was 158 cases (See Table 1 for parameter settings [i.e., under the header Analysis Inputs] and the results for the power analysis [i.e., under the header Analysis Output] and Figure 1 for the complete power plot graph).

Table 1.

Power Analysis Estimated Parameters and Results

Analysis Inputs:		Statistic	
Test Family =	*F*-tests		
Statistical Test = ANOVA: Fixed effects, main effects and interactions			
Type of Power Analysis =	A priori: Compute required sample size		
Effect size *f*		=	0.25
(Significance Level) α err probability		=	0.05
Power (1-β err probability)		=	0.80
Numerator *df*			2
Number of groups			3
Number of covariates		=	1
Analysis Output:	Noncentrality parameter λ	=	9.88
	Critical F	=	3.05
	Denominator *df*	=	154
	Total sample size	=	158
	Actual power	=	0.802

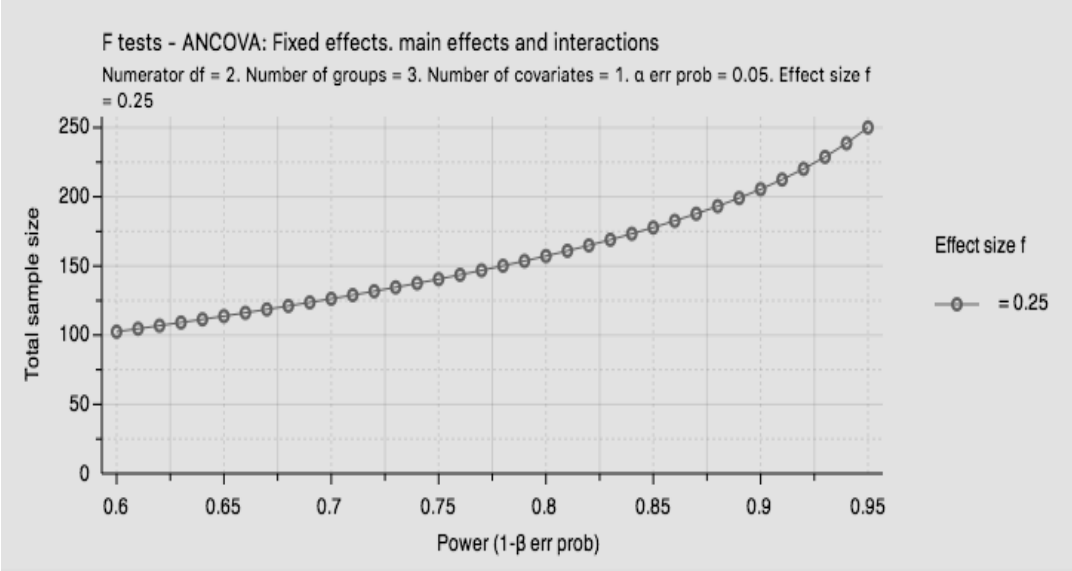

Figure 1. Power plot graph.

The study population included at least 158 survey participants from various locations. The sample size of $n = 158$ meets the 80% power requirement, significance (i.e., alpha) level of .05, and two degrees of freedom for the three groups represented (i.e., traditional prescription based therapy, nontraditional based therapy, and traditional and nontraditional therapy) per G*Power 3.1 statistical software calculation (Field, 2013; Petchenik & Watermolen, 2011; Vaske, 2014). Because this research was targeted towards patients who have access to different pain management options (i.e., traditional and nontraditional), web-based techniques allowed a large number of responses from participants living in multiple states with different medical marijuana legislation to be efficiently collected and analyzed (Rudestam & Newton, 2015).

The WHOQOL-BREF was converted into a web-based survey to facilitate administration, collection, and analysis of survey results. Survey data collected online gives significant improvements concerning geographic coverage, speed relative to mailed options and interviews, and offers lower cost and better response rates than some other methods (Frankfort-Nachmias & Nachmias, 2015). Many researchers use online survey data collection, and many have found no difference between data collected through traditional means and from Internet research (Ahern, 2005; Frankfort-Nachmias & Nachmias, 2015).

Procedures for Data Collection, Recruitment, and Participation

I collected demographic, treatment, and QOL related information using the WHOQOL-BREF, which is an existing valid and reliable QOL questionnaire (Skevington et al., 2004), via SurveyMonkey. Use of a valid and reliable instrument is an

important aspect when conducting quantitative research (Creswell, 2009). SurveyMonkey is an appropriate method to collect sensitive information because it is based on secure protocols (SurveyMonkey, 2016a; Walden University, 2016). The WHOQOL-BREF is more objective than other QOL instruments (e.g., SF-36) and is able to differentiate between the QOL of two cancer patients even though they are experiencing similar symptoms and side effects (Keogh et al., 2013). My purposive sampling methodology collection plan did have a shortcoming because generalizations to the whole population are limited (Frankfort-Nachmias & Nachmias, 2015).

All participants were recruited anonymously through various organizations. I contacted both brick and mortar and web-related healthcare organizations and entities to request permission to obtain volunteer participants from their pools of patients, members, or readers via public flyer. Additionally, the SurveyMonkey participation group program (i.e., SurveyMonkey Contribute) was used to target individuals who were at least 18 years of age, were previously diagnosed with cancer, and experienced chronic pain. I did not initiate contact with participants directly because the survey data were collected anonymously.

Participant recruitment procedures included both active and passive techniques. Fleming et al. (2015) evaluated the effectiveness of active versus passive recruitment for a group-based intervention study and determined that both methods were needed to reach effective sample sizes. Active recruitment methods included contacting participants through healthcare professional organizations, and passive recruitment methods included use of flyers, posters, public events, and media (Fleming et al., 2015). Although both

passive and active recruitment techniques can yield a sufficient participant pool, passive recruitment typically costs less per participant recruited (Fleming et al., 2015).

The participant pool was obtained through various techniques. Participants were recruited passively through flyer advertisement with cooperating medical-related organizations or entity populations and specific SurveyMonkey contributors. An Institutional Review Board (IRB) approved flyer was digitally posted on the websites of and/or physically posted in participating organizations. Fleming et al. (2015) experienced a 73% recruitment rate when flyers were targeted in medical related areas. Given Health Insurance Portability and Accountability Act of 1996 (HIPAA) and informed consent procedures, organizations or entities could make active recommendations of specific participants for the study. Participants gathered actively were sent the same marketing flyer that was used for passively recruited participants.

No matter how participants are gathered (i.e., passively or actively), all IRB and HIPAA guidelines were followed to ensure health and personal information were protected appropriately (U.S. Department of Health & Human Services, n.d.; Walden University, 2016). Most of the participants were recruited passively, but whether participants were gathered actively or passively, all identities remained anonymous. The website data collection process was the same for both actively or passively recruited participants.

Data collection, consent, and access were accomplished through SurveyMonkey. Participants accessed a provided web link to begin the survey process. Once the participant selected the link, partial access to the survey was allowed. Once the

participant completed and agreed to the informed consent agreement, full access to the survey was granted. The SurveyMonkey interactive version of the WHOQOL-BREF measured social and environmental aspects of QOL along with physical and psychological factors relevant to the participant (Keogh et al., 2013). Thus, the WHOQOL-BREF has distinct measures beyond side effects and symptoms that might be affecting the QOL of participants (Keogh et al., 2013).

Self-reported data are generally as valid as non-self-reported data in assessments concerning the perception of participants (Chan, 2009). Participants were assured that their identity and responses would remain confidential throughout the research process. Furthermore, researchers have used web-based informed consent procedures (Colvin & Lanigan, 2005), and I used a similar method for informed consent requirements because sensitive information was collected.

Completed survey data were downloaded, collected, and stored into an Excel file and backed up on a secure jump drive. After data were downloaded, it was transferred to Statistical Package for the Social Sciences (SPSS) for processing and analysis. Both the computer and jump drive were password protected and kept in a private residence. Only I had access to the data.

During these processes, no personal data were collected or associated. Data were collected excluding all respondent information (e.g., name, email address, and IP address; SurveyMonkey, 2016b). Through the informed consent procedure, participants understood their survey data could not be removed once submissions were complete because no participant identifiers were collected. No participant identifier information

was collected through active recruitment. All passive recruitment and web-based survey data collection used anonymous collection techniques.

The anonymity of participants was assured because only aggregate data will be published. I will make overall study results available to participants once completed and allowed contact with me concerning any questions or concerns. The specific information concerning post-research data web link was provided at the end of the survey. Specific information concerning individuals will not be available or allowed.

Instrumentation and Operationalization of Constructs

The WHO has defined health as more than the absence of disease, but as an assessment of QOL related to "physical, mental, and social well-being" (WHO, 1997b, p. 1). In 1991, the WHO developed a generic QOL instrument, known as the WHOQOL-100, to be used for various diseases, severities, and cultural groups (Bonomi et al., 2000). The 4-domain WHOQOL-BREF was developed from the 6-domain WHOQOL-100, was confirmed for use with sick and well participants, and showed generally consistent results when compared to the WHOQOL-100 (Skevington et al., 2004). The WHOQOL-BREF has shown cross-cultural validity and covers a broad range of factors (Skevington et al., 2004). The 26-question WHOQOL-BREF contains two overall QOL questions and 24 questions for the four QOL domains and corresponding items (i.e., physical health [7 items], psychological [6 items], social relationships [3 items], and environmental [8 items]; Skevington et al., 2004; WHO, 1997a; see Figure 2). These domains and corresponding items are assessed through use of 5-point scales and descriptors (Szabo, Orley, & Saxena, 1997).

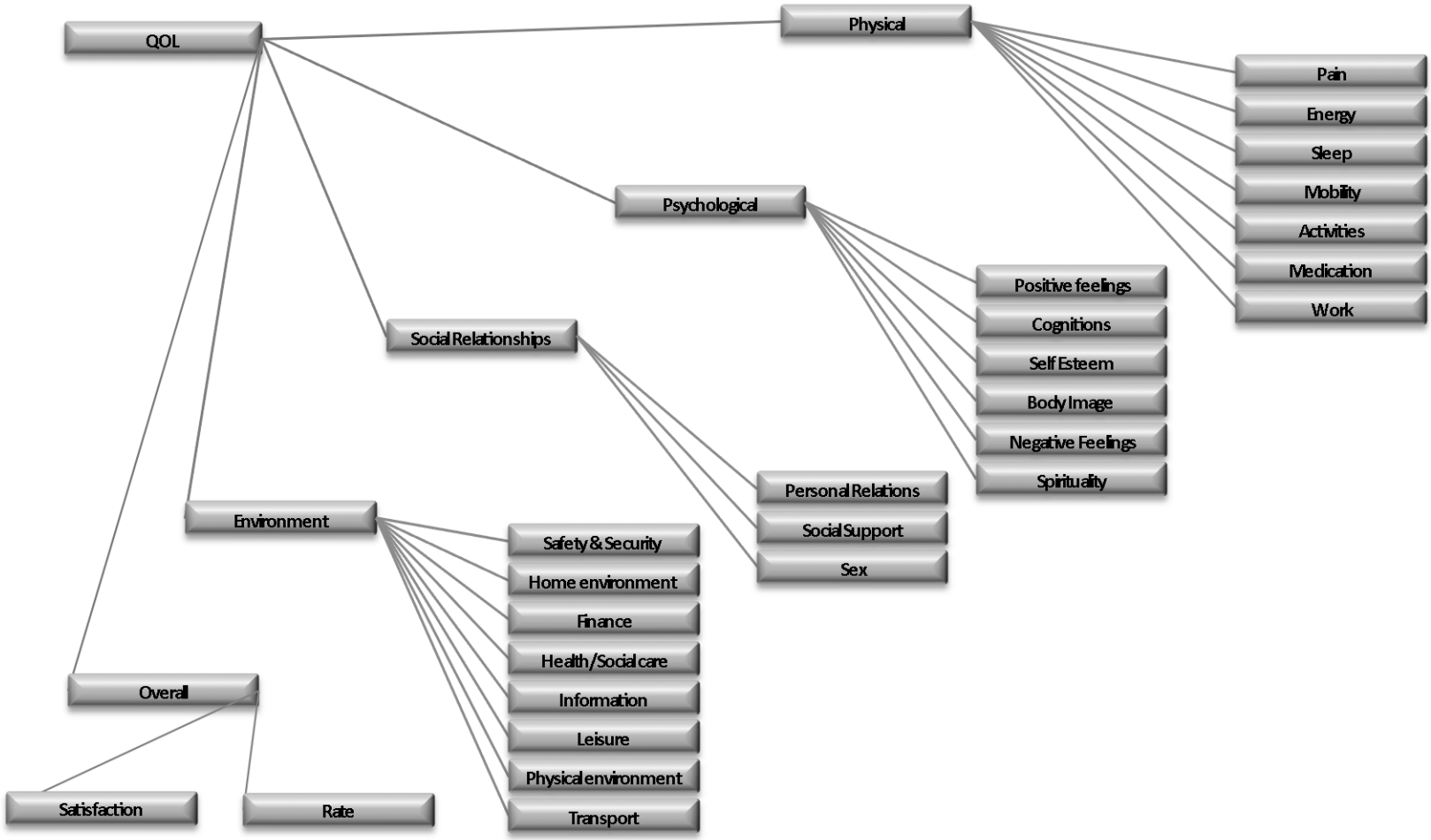

Figure 2. WHOQOL-BREF Domain Factors and Items (Skevington et al., 2004; WHO, 1997a)

Social scientists use scales and indexes to enable reduction and compilation of data to scores that increases reliability and allows quantitative measurement (Frankfort-Nachmias & Nachmias, 2015). The WHOQOL-BREF has been used to assess cancer patients (Cristina Mansano-Schlosser & Filomena Ceolim, 2012; Jeong, Sim, Hwang, & Kim, 2011; Keyzer-Dekker et al., 2012; Mendes et al., 2014; Oliveira, Costa, Manzoni, & Cabral, 2014; Peretti-Watel, Bendiane, Spica, & Rey, 2012; Vaz et al., 2007). According to a multidimensional QOL instrument study, the WHOQOL-BREF scored acceptable concerning the following: (a) overall measures of internal consistency, test-retest reliability, content validity, and inter-domain correlation; (b) similar with SF-36 concerning convergent validity; and (c) factorial validity of its domains and known-group validity between well and sick individuals (Zeng, Ching, & Loke, 2010). The WHOQOL-BREF performed well concerning item–response distributions, reliability, construct validity, and discriminant validity and may be one of the leading instruments for measuring generic QOL (Skevington et al., 2004).

The QOL measure has yielded important information concerning interventions and clinical care of cancer patients and survivors (Jacobsen & Jim, 2011). There are many different types of QOL instruments including generic (e.g., SF-36 and WHOQOL-BREF) and cancer specific ones (e.g., FACT-B+4). Oliveira et al. (2014) evaluated the SF-36 and WHOQOL-BREF with the FACT-B+4 on 106 women with breast cancer and determined that the WHOQOL-BREF and FACT-B+4 were similar in most measurement properties and adequate to assess QOL.

Many of the cancer specific QOL instruments provide a more comprehensive assessment of symptoms than generic QOL instruments for cancer participants (Jacobsen & Jim, 2011). In a small sample of breast cancer patients, the WHOQOL-BREF did not always capture the iatrogenic chronic pain of the participant (Peretti-Watel et al., 2012). Generic instruments are typically used to make QOL comparisons between specific cancer groups (i.e., cervical cancer survivors) and the general population (Zeng et al., 2010). Cancer specific QOL instruments are used on a group of participants with the same type of cancer (Jacobsen & Jim, 2011). The WHOQOL-BREF "permits the comparison of QOL in patients with different diseases" (Vaz et al., 2007, p. 586). Given that my participant pool includes individuals with many types of cancer, the use of the WHOQOL-BREF (See Appendix A) was most appropriate.

Health self-assessments (e.g., WHOQOL-BREF) have shown to be reliable predictors of cancer patient QOL and can help medical providers assess symptoms and direct treatments (Cristina Mansano-Schlosser & Filomena Ceolim, 2012). Quality of life instruments help produce "objective data from subjective realities" to allow investigation of associated factors (Vaz et al., 2007, p. 584). Using data from a large, diverse sample (i.e., 11,830 participants from 23 countries) and factor analysis, Skevington et al. (2004) indicated that the WHOQOL-BREF showed internal consistency (i.e., > .7 per Cronbach α), item-total correlations (i.e., $p < .001$ per Pearson), construct validity, discriminant validity (i.e., $p < .001$ per multiple regression), and good to excellent reliability of psychometric properties.

Van Esch, Den Oudsten, and De Vries (2011) evaluated women with breast problems (i.e., benign or malignant) and concluded that the WHOQOL-BREF appeared to be a reliable and valid instrument. The WHOQOL-BREF provided comparable results to the WHOQOL-100, good test-retest reliability, and good psychometric properties (Van Esch et al., 2011). The 100-question WHOQOL-100 may be burdensome for some participants, and the WHOQOL-BREF served as an alternative instrument (Skevington et al., 2004; Van Esch et al., 2011). Evidence indicated shorter measures typically have higher response rates (Harper & Power, 1998; Van Esch et al., 2011). The WHO approved use of the WHOQOL-BREF for my dissertation research (See Appendix B).

Researchers should consider the purpose, psychometric properties, and inclusiveness of a study when selecting a QOL instrument (Zeng et al., 2010). Jeong et al. (2011) used the WHOQOL-BREF in a cross-sectional, convenience sample of 39 women with breast cancer-related lymphedema to study the QOL of various subgroups. Cancer participants with greater disability and pain were observed to have lower QOL (Jeong et al., 2011). Vaz et al. (2007) used the WHOQOL-BREF in a cross-sectional study of 103 women with gynecologic cancer and identified cancer-related symptoms that interfered with QOL. Vaz et al. (2007) noted a relationship between cancer-related pain and impacts on multiple QOL factors indicating the importance of pain management considerations on the QOL of cancer patients. Mendes et al. (2014) used the WHOQOL-BREF in a cross-sectional, convenience sample of 56 cancer patients in palliative care to study analgesic treatments (i.e., adjuvants, opioids, or nonopioids) and QOL.

Data collected in the study included standard demographic and healthcare information (e.g., gender, date of birth, education level, marital status, health status, and pain management method) and the 26-scaled items in the WHOQOL-BREF. The WHO defines QOL as "individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" (WHOQOL Group, 1996, p. 5). The WHOQOL Group views the perspective and beliefs of individuals concerning the nature of disease as important elements influencing the quality of their lives (WHO, 1997b).

Cancer pain management was operationalized as the independent variable, QOL as the dependent variable, and gender as a moderator. Cancer pain management was defined as traditional prescription based therapy (i.e., opioids), nontraditional based therapy (i.e., cannabis), or traditional and nontraditional therapy. These three pain management categories were the primary analysis groups to address the research questions: (1) Use of opioids, (2) use of cannabis, and (3) use of opioids and cannabis. Specific types and quantities of opioids, cannabis, complementary, alternative, nonopioid, and adjuvant treatments were not analyzed.

Many complementary, alternative, nonopioids, and adjuvant treatments have been addressed in past research. Mendes et al. (2014) indicated that the majority of cancer patients used adjuvants, to counter opioid side effects, and nonopioids; therefore, these two categories of treatments were excluded. Shneerson et al. (2013), Bao et al. (2014), Ben-Arye et al. (2014), and Bar-Sela et al. (2015) explored various complementary and alternative treatments for cancer care but only Bao et al. (2014) included cannabis.

Further, Mendes et al. (2014) did not include cannabis use as a complementary or alternative treatment in their QOL related study. Bowles et al. (2012) and van den Beuken-van Everdingen et al. (2016) noted a lack of data concerning various cannabis and conventional pain medications concerning cancer-related pain.

The QOL variable is operationalized through techniques developed and established in the cross-culturally validated and reliable WHOQOL-BREF (Skevington et al., 2004). The 26-item WHOQOL-BREF is broken down into areas identified in Appendix A (i.e., items 27 to 30). After reversing the values for three questions, domain questions are scored from 1 to 5 per the raw item Likert-like score (Likert, 1932; Szabo et al., 1997). Each of the four domains (i.e., physical health, psychological, social relationships, and environment) and overall QOL dimensions has different number of corresponding questions and raw domain score range (WHO, 1997a). Higher scores indicate a higher QOL (WHO, 1997a).

The WHO has established procedures for missing data and transformation of raw scores (WHO, 1997a). Both the physical health and environment domains can tolerate one missing value through an average process, but questions applicable to the psychological and social relationship domains must all be coded (WHO, 1997a). The transformation of the raw data domain totals converts the possible scores for each domain into a scale from zero to 100 (WHO, 1997a). For example, the minimum and maximum raw values for the social relationships domain are 3 and 15, respectively (WHO, 1997a). If a participant scored 9, then the transformed score would be 50 (See Figure 3). These

transformed values can then be compared and analyzed to the various pain management options and gender, as appropriate, with the SPSS program, version 23.

$$\text{Transformed Scale} = \left[\frac{\text{(Actual raw score – lowest possible raw score)}}{\text{(Possible raw score range)}} \right] \times 100$$

Figure 3. Transformation of Scale Scores (WHO, 1997a)

The two quantitative research questions (RQs) and corresponding null and alternative hypotheses were derived from theory and provided the focus for this study.

First Research Question. RQ^1: To what extent, if any, is there a difference between cancer patient's quality of life (QOL) and types of cancer pain management therapy (i.e., traditional prescription based therapy [i.e., opioids], nontraditional based therapy [i.e., cannabis], and combined traditional and nontraditional therapy)?

Independent Variable: Cancer pain management, described as:

- Traditional prescription based therapy (opioids)
- Nontraditional based therapy (cannabis)
- Traditional and nontraditional therapy

Dependent Variable: Quality of life

$H_0$1: Quality of life will not differ between cancer pain management types.

H_a1: Quality of life will differ between cancer pain management types.

Second Research Question. RQ^2: To what extent, if any, does gender affect the relationship between cancer patient's quality of life (QOL) and types of cancer pain management therapy (i.e., traditional prescription based therapy [i.e., opioids],

nontraditional based therapy [i.e., cannabis] and combined traditional and nontraditional therapy?

Independent Variable: Cancer pain management, described as:

- Traditional prescription based therapy (opioids)
- Nontraditional based therapy (cannabis)
- Traditional and nontraditional therapy

Dependent Variable: QOL

Moderator: Gender (female or male)

$H_0$2: The impact of cancer pain management type on QOL is not moderated by gender.

H_a2: The impact of cancer pain management type on QOL is moderated by gender.

Given the nature and number of the variables, ANOVA was the appropriate statistical approach (Creswell, 2009). The dependent variable was scaled at the ratio level because overall scores were obtained through averaging techniques set forth by WHO (1997a). The independent variable was scaled at the nominal level meaning that the pain management type of participants was categorical vice mathematical in nature (Field, 2013). Specifically, it was assumed no mathematical relationship exists between traditional pain management and nontraditional pain management use. Gender was used as a moderator for the relationship as specified in the second research question.

Detailed Analysis. For a single dependent variable, the *F*-test assesses the overall mean differences through calculations using the systematic and unsystematic variances

(Field, 2013). In addition to the *F*-test and specific contrasts, the effect size (i.e., eta squared) was also used to measure the overall effect of the ANOVA (Field, 2013). Eta squared is often considered biased because it only describes the variance in the dependent variable by the independent variable in the sample but not population (Field, 2013). Cohen's (1992) guidelines for eta-square (η^2) are .01 for small effect, .06 for moderate effect, and .14 for large effect. Eta squared is calculated using the following equation:

Eta squared = model (between groups) sum of squares ÷ total sum of squares

For both research questions, the SPSS software program, student version 23.0, was used to process data with the ANOVA testing. ANOVA testing compares means across two or more independent groups to determine if they differ significantly (Field, 2013). Because the causal variable was not manipulated, only determination of co-occurrence, not causality, was possible (Field, 2013). Fisher and Kelly derived the probability distribution and corresponding correlation ratio in the 1920s and 1930s, respectively (Huberty, 2002). The ANOVA equation is simply the between-groups variability divided by the within-groups variability or error variance (Mertler & Vannatta, 2013):

F = variance between participants ÷ variance expected due to chance (error)

The calculation assesses the variation in scores found between the three groups and divides that by the error variance or variation in scores found within these groups (Mertler & Vannatta, 2013). If an *F*-ratio was less than 1, then unsystematic variance was greater than systematic variance, and a result could be due to mere chance (Field, 2013). The *F*-test is referred to as an omnibus test because it assesses the overall fitness of the

model but does not provide specific information concerning individual groups (Field, 2013).

If the *F*-ratio was statistically significant, then contrast procedures were accomplished to determine which specific group comparisons were significant (Field, 2013). Because there are three groups, two contrasts were required (Field, 2013). First contrast was traditional score versus both nontraditional score and traditional and nontraditional scores. The second contrast was nontraditional score versus traditional and nontraditional score. Planned contrasts of the different groups helped identify if cannabis was associated with changes in the QOL of cancer patients (See Figure 4).

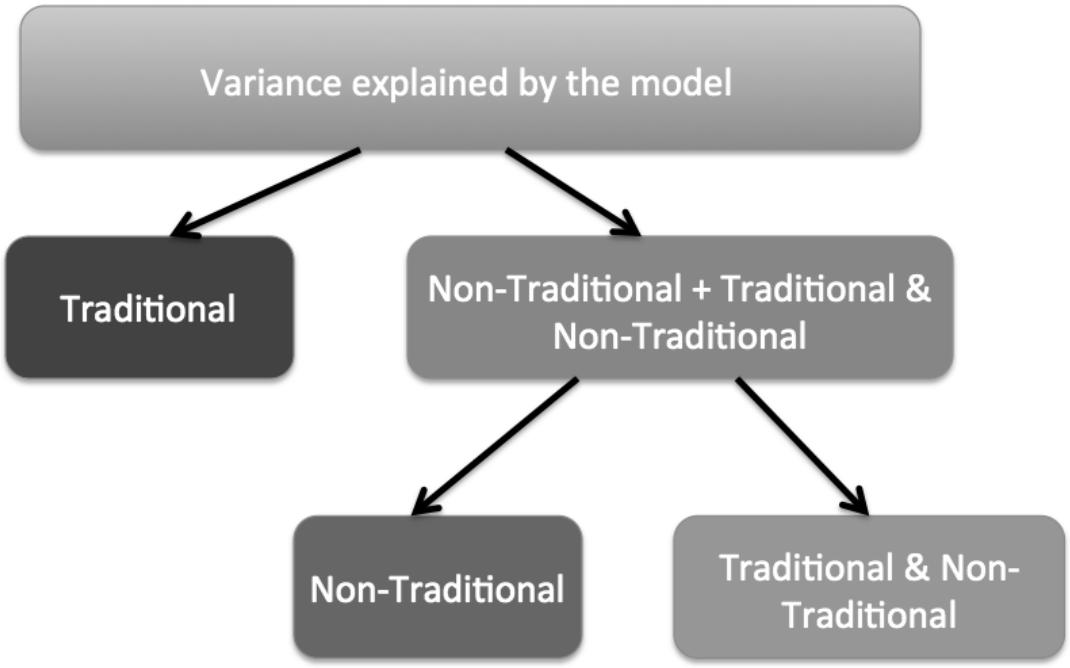

Figure 4. Planned Contrasts for Variance (Field, 2013)

The concept of moderation helps identify limits of an effect (e.g., circumstance or type of person) and the level of this effect (e.g., present or absent; Hayes, 2013). Gender was used as a dichotomous, categorical moderator to help identify any level of effect between the independent and dependent variables (See Figure 5). To test the potential moderating effects of gender on the pain management type-quality of life relationship, a multiple regression analysis was conducted using SPSS and the PROCESS (v2.15) macro (Field, 2013; Hayes, 2013). The criterion variable pain management type, predictor variable quality of life, and moderator variable gender were entered into the regression model number 1 PROCESS macro for SPSS to identify the appropriate interactions (Hayes, 2013).

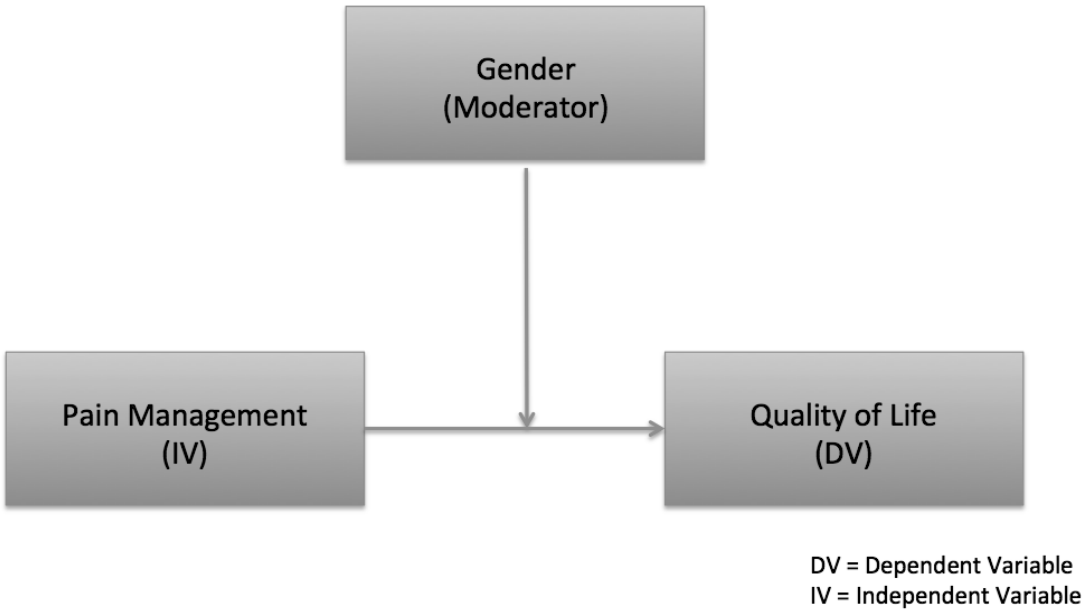

Figure 5. Gender as Categorical Moderator (Field, 2013; Hayes, 2013)

Hayes (2013) developed the PROCESS application for regression based mediation, moderation, and conditional processing. The moderator process helps identify variable(s) that change the size or direction of relationships through the pick-a-point approach or analysis of simple slopes (Hayes, 2013). The output of the moderation should indicate regression points for gender given the different pain management types concerning QOL. Figure 6 illustrates the proposed statistical model of pain management type, gender, and QOL. The regression analysis should indicate relationships between pain management type and QOL concerning gender. Relationships were analyzed for significance concerning possible similarity (Hayes, 2013). The analysis of the statistical model helped determine whether the null hypothesis should be rejected or if it failed to be rejected.

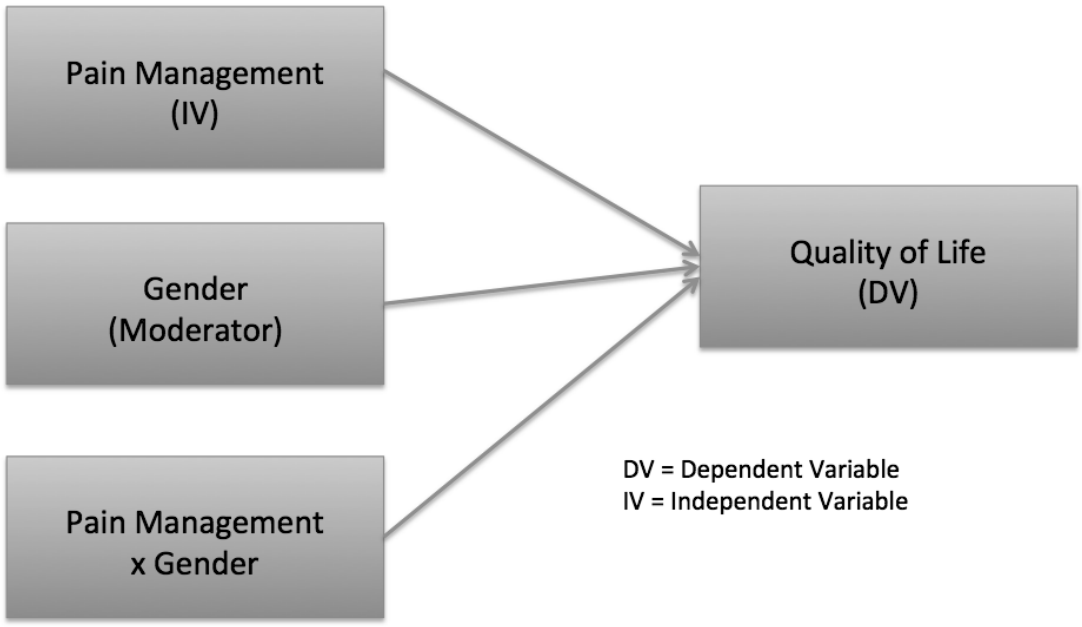

Figure 6. Moderation Statistical Model (Field, 2013; Hayes, 2013)

Threats to Validity

Extrinsic and intrinsic factor interactions are considered potential threats to validity (Frankfort-Nachmias & Nachmias, 2015). Selection-history is one such extrinsic threat factor (Frankfort-Nachmias & Nachmias, 2015). Because the WHOQOL-BREF has shown cross-cultural validity concerning QOL across the four measured domains (Skevington et al., 2004), the potential selection-history threat was countered. The current treatment phase of the participant could cause variability in QOL unrelated to pain management type (Oliveira et al., 2014). Such variability could warrant use of a more homogeneous sample concerning treatment (Oliveira et al., 2014). Because the reactions of cancer patients to various treatments are often related (Tazaki et al., 1998), it was assumed that the various treatment groups assessed would have similar treatment phase participants.

Intrinsically, the four WHOQOL-BREF domain scores showed a strong association to overall QOL measures (Skevington et al., 2004). The WHOQOL-100 successfully evaluated the QOL of cancer patients (Tazaki et al., 1998). The WHOQOL-BREF served as an alternative instrument to the WHOQOL-100 for women with benign or malignant breast problems (Van Esch et al., 2011) and was adequate to assess the QOL of women with breast cancer (Oliveira et al., 2014). Although randomized, experimental research can help counteract threat factors, cross-sectional or correlational design is often employed in social science, survey research (Frankfort-Nachmias & Nachmias, 2015).

Mansano-Schlosser and Ceolim (2012) assessed cancer patients with the WHOQOL-BREF in a cross-sectional descriptive study. Self-reported data were as valid

as non-self-reported data concerning the perception of participants (Chan, 2009). Self-reported data indicated reliability in predicting participant QOL (Mansano-Schlosser & Ceolim, 2012). Van Esch et al. (2011) evaluated the WHOQOL-BREF concerning the QOL of women with benign or malignant breast problems and concluded it a reliable and valid instrument. The generic nature and cross-cultural validity of the WHOQOL-BREF allows QOL comparisons for patients with different diseases (Vaz et al., 2007). Given these findings, I planned to build upon previous evidence (i.e., concerning the possible relationship between cannabis and opioids regarding pain and QOL) using appropriate statistic techniques in order to examine possible relationships or causal inference (Frankfort-Nachmias & Nachmias, 2015).

Ethical Procedures

Ethical considerations were addressed to ensure protection and confidentiality of participants. These measures were consistent with Walden IRB privacy, security, and ethical standards. In order to protect the health information of the anonymous and voluntary participant pool, I complied with HIPAA, IRB, and related regulations. All information was collected anonymously and securely using standards set up through data collection criteria in SurveyMonkey (SurveyMonkey, 2016a, 2016b). Permission documentation from organizations was not required because research invitations were anonymous and voluntary. Also, a number identifier was used to represent the data of each participant.

All information was held securely and privately. All primary data and analysis results were kept on a password-protected home computer and were backed up with a

USB drive. Security procedures were taken to protect data during all research steps including data collection, data transfer, data analysis, and archiving (e.g., password protection and locks). The transferred data were de-identified, as required, and data will be password protected, secured, locked, and protected for 5 years. After that time period, all data will be destroyed.

All of the various research risks and burdens were minimized in order to protect participants. Psychological risks were minimized in use of a standardized, valid, and reliable instrument in a private setting (i.e., personal computer). Relationship risk was minimal because a participant may recognize my last name, but I had no power over any participant. There were minimal economic, professional, or physical risks and no conflicts of interest. Survey data were collected anonymously for all participants.

Summary

The QOL measure has yielded important information concerning interventions and clinical care of cancer patients and survivors (Jacobsen & Jim, 2011). The WHOQOL-BREF was used in cross-sectional studies to indicate the effects of pain on the QOL of cancer patients (Mendes et al., 2014; Vaz et al., 2007). Researchers used the WHOQOL-BREF to study the QOL of cancer patients with different (Mendes et al., 2014) and similar (Vaz et al., 2007) types of cancers using cross-sectional, convenience studies. According to Mendes et al. (2014), the majority of cancer patients used adjuvants (i.e., to counter opioid side effects) and nonopioids, but cannabis was not included in their study. Vaz et al. (2007) indicated the importance of the QOL of cancer patients on pain management considerations.

Cancer pain management was specified as the independent variable, QOL as the dependent variable, and gender as a moderator. Cancer pain management was defined as traditional prescription based therapy (i.e., opioids), nontraditional based therapy (i.e., cannabis), or traditional and nontraditional therapy. These three categories were the primary analysis groups to address the research questions. Data collected included standard demographic and healthcare information (e.g., gender, date of birth, education level, marital status, health status, and pain management method) and the 26-scaled items in the WHOQOL-BREF.

The WHOQOL-BREF "permits the comparison of QOL in patients with different diseases" (Vaz et al., 2007, p. 586). Given that my participant pool included individuals with many types of cancer, the use of the WHOQOL-BREF was most appropriate. SurveyMonkey was used to streamline the self-assessment data collection (See Appendix C). Health self-assessments (e.g., WHOQOL-BREF) have shown to be reliable predictors of cancer patient QOL and can help medical providers assess symptoms and direct treatments (Mansano-Schlosser & Ceolim, 2012). QOL instruments help produce "objective data from subjective realities" to allow investigation of associated factors (Vaz et al., 2007, p. 584).

The results of the study will be included in Chapter 4 using three sections (i.e., data collection, results, and summary). The data collection section will include response rates, discrepancies, and baseline characteristics of participants during the survey process. The results section will include descriptive statistics, complete statistical analysis, hypothesis and assumption evaluation, and post-hoc inferential results. In the summary

section, I will summarize the research questions, overview the study design and hypotheses results, and introduce the reader to Chapter 5 content.

Chapter 4: Results

Introduction

The purpose of the nonexperimental research was to determine the effects different types of cancer pain management treatments may have on cancer patients' QOL. The study involved elements of the HBM (Hochbaum et al., 1952) including benefits, barriers, cues to action, and self-efficacy concepts (Abraham & Sheeran, 2005; Broussard & Weber-Breaux, 1994; Rosenstock et al., 1988; Wallace, 2002). Pain management therapies for cancer patients (i.e., defined by traditional [i.e., opioids], nontraditional [i.e., marijuana, also known as cannabis], and combined nontraditional and traditional) are often related to these HBM concepts and QOL is affected. Pain management is an essential determinant of patient outcomes because unrelieved pain significantly comprised patient QOL and effective pain management was associated with patient survival (Perlman et al., 2013).

Gender (i.e., male and female) was also examined to determine if it affects the difference in cancer patient pain management and QOL. Studies indicate mixed results concerning use and abuse of both opioids and marijuana when gender is considered (Greenfield et al., 2010). Relationships concerning gender, pain sensitivity, and pain management treatments warrant further investigation (Cooper & Haney, 2016; Lenz et al., 2011). Gender provided a research opportunity because effects of opioid and marijuana on cancer patient QOL have not been evaluated under these conditions.

Pain is a secondary health problem that many cancer patients suffer which may relate to their QOL (Shneerson et al., 2013). My research focused on nontraditional (i.e.,

cannabis) and/or traditional pain management (i.e., opioids) treatments and their relationship to cancer patients' QOL. Two quantitative research questions (RQs) and corresponding null and alternative hypotheses were derived from theory and provided the focus for this study.

First Research Question and Hypotheses

Research Question 1: To what extent, if any, is there a difference between cancer patient's quality of life (QOL) and types of cancer pain management therapy (i.e., traditional prescription based therapy [i.e., opioids], nontraditional based therapy [i.e., cannabis], and combined traditional and nontraditional therapy)?

The independent variable (i.e., cancer pain management) and the relationship to the dependent variable (i.e., QOL) were examined using the following hypotheses:

$H_0$1: Quality of life will not differ between cancer pain management types.

H_a1: Quality of life will differ between cancer pain management types.

Analysis of variance (ANOVA), planned contrasts, and post hoc tests were used to evaluate the research question and corresponding hypotheses.

Second Research Question and Hypotheses

Research Question 2: To what extent, if any, does gender affect the relationship between cancer patient's quality of life and types of cancer pain management therapy (i.e., traditional prescription based therapy [i.e., opioids], nontraditional based therapy [i.e., cannabis] and combined traditional and nontraditional therapy?

The independent variable (i.e., cancer pain management) and the relationship to the dependent variable (i.e., QOL) as moderated by gender were examined using the following hypotheses:

$H_0$2: The impact of cancer pain management type on quality of life is not moderated by gender.

H_a2: The impact of cancer pain management type on quality of life is moderated by gender.

Moderated ANOVA analyses were used to evaluate the research question and corresponding hypotheses.

Results of the study were included in this chapter using three sections (i.e., data collection, results, and summary). The data collection section includes response rates, discrepancies, and baseline characteristics of participants during the survey process. The results section includes descriptive statistics, complete statistical analysis, hypothesis and assumption evaluation, and post-hoc inferential results. The summary section includes analysis of the research questions, overview of the study design, and hypotheses results.

Data Collection

Data collection began about a week after IRB approval. The IRB approval date was March 6, 2017 (i.e., approval number 03-06-17-0311376), and data were collected from March 14, 2017 until April 21, 2017. Over 70 cancer and medical-related individuals with group affiliations were communicated with concerning community partnership. Approximately 25% of these points of contact responded favorably to coordinate the research flyer information to potential participants.

Participants were reached through three main sources. First, approximately 17 cancer and medical-related groups, which varied in size (i.e., approximately 50 to 250 members), contributed to the research. Second, the SurveyMonkey Contribute program was used, but less than 10 participants (15%) of the chronic pain group addressed responded being a cancer patient. Third, the largest participant group was reached through a community partnership with a cancer patient research firm. This firm coordinated the research flyer information to their full list of 20,000 cancer patients on two occasions (i.e., original and follow-up distributions). Not counting the SurveyMonkey Contribute group, response rate of potential participants, once the research flyer information coordinated, was approximately 1.5%. Because the survey information was collected anonymously, exact response rates from each group could not be determined.

The data collection process was consistent with procedures set up in Chapter 3. Because participant response rate was approximately 1.5%, the community partnership with the cancer patient research firm helped speed up the data collection timeframe. A summary of research results will be coordinated with points of contact of the cancer patient research firm, and these summary findings will be coordinated to their group members. At the conclusion of the survey, all participants were given notice of a public website which will contain a report of the same summary of research findings. During the data collection timeframe, I answered several questions from possible participants via email since my contact information was provided on the research flyer and informed consent.

Data Analysis Procedure

The sample data were coded, screened, and tested with descriptive and inferential statistics. Excel was used to code the SurveyMonkey data. The Excel worksheet was imported into the Statistical Package for the Social Sciences (SPSS) version 23.0. The SPSS was used to further code, screen, and organize the collected survey data. Where appropriate, summarized values were tabulated including demographic frequency counts and percentages. Computations were also preformed on the variables, which included mean, variance, and standard deviation. Prior to research question analysis, tests were performed to ensure statistical assumptions were met.

The variables were explored for various characteristics prior to analyzing the research questions using the general linear model. Exploration included checks for missing data and outliers using frequency counts, graphs, and plots, and checks for normality and homoscedasticity (i.e., homogeneity of variance). After this evaluation, ANOVA, planned contrasts, post hoc tests, and moderated ANOVA analyses (i.e., using the PROCESS tool in SPSS; Field, 2013; Hayes, 2013) were run to test the two research questions. Displayed in Table 2 is a summary of the dependent and independent variables and statistical analyses used to evaluate the two research questions.

Table 2

Variables and Statistical Tests Used to Evaluate Research Questions 1 and 2

Research Question	Dependent Variable	Independent Variable	Moderator	Analysis
RQ[1]	Quality of Life	Pain Management Therapy Type		ANOVA
RQ[2]	Quality of Life	Pain Management Therapy Type	Gender	PROCESS tool*

* (Field, 2013; Hayes, 2013)

Demographics

Data were collected from 617 individuals via SurveyMonkey. However, 60 participants (i.e., from SurveyMonkey Contribute group) stated that they did not nor had they ever had cancer, 17 participants did not complete the WHOQOL-BREF survey (i.e., no dropout pattern), and 304 stated they did not use one or more of the traditional and nontraditional pain management therapies evaluated in the current study. Therefore, the aforementioned 381 participants were removed from all analyses and a sample of 236 individuals was evaluated in current study ($N = 236$). Females (86.4%, $n = 204$) made up the majority of participants, and the remaining 13.6% were male ($n = 32$). Further, 41.1% of participants were between 55 and 64 years old ($n = 97$), and 31.8% were between 45 and 54 years old ($n = 75$). The frequency and percent statistics of participants' gender and age groups are displayed in Table 3.

Table 3

Frequency and Percent Statistics of Participants' Gender and Age Groups

Demographic	Frequency (*n*)	Percent (%)
Gender		
Male	32	13.6
Female	204	86.4
Total	236	100.0
Age Group		
18 - 34 years	9	3.8
35 - 44 years	27	11.4
45 - 54 years	75	31.8
55 - 64 years	97	41.1
65+ years	28	11.9
Total	236	100.0

Note. Total $N = 236$

The sample of 236 individuals was evaluated in the current study ($N = 236$) for highest level of education and marital status. The majority of participants had some college (51.7%, $n = 122$), and 23.7% had a Bachelor's degree ($n = 56$). Additionally, 58.5% of participants were married ($n = 138$), and 14% were divorced ($n = 33$). Frequency and percent statistics of participants' highest level of education and marital status are displayed in Table 4.

Table 4

Frequency and Percent Statistics of Participants' Highest Level of Education and Marital Status

Demographic	Frequency (*n*)	Percent (%)
Education		
Less than High School	1	0.4
High School	17	7.2
Some college	122	51.7
Bachelor's degree	56	23.7
Graduate degree	40	16.9
Total	236	100.0
Marital Status		
Single	26	11.0
Married	138	58.5
Living as married	14	5.9
Separated	9	3.8
Divorced	33	14.0
Widowed	16	6.8
Total	236	100.0

Note. Total $N = 236$

The sample of 236 individuals was evaluated in the current study ($N = 236$) for level of chronic pain, cancer stage, and type of pain management therapy used. The majority of participants were experiencing chronic pain (95.8%, $n = 226$), and 4.2% self-reported not experiencing chronic pain ($n = 10$). Additionally, 41.5% of participants were Stage IV ($n = 98$), and 23.7% were Stage III ($n = 56$). Concerning pain management

therapy used, the majority of participants used opioids (72%, *n* = 170), 15.3% (*n* = 36) used a combination of opioids and marijuana, and 12.7% (*n* = 30) used marijuana. Frequency and percent statistics of participants' chronic pain, cancer stage, and type of pain management therapy used are displayed in Table 5.

Table 5

Frequency and Percent Statistics of Participants' Level of Chronic Pain, Cancer Stage, and Type of Pain Management Therapy

Demographic	Frequency (*n*)	Percent (%)
Chronic Pain		
Yes	226	95.8
No	10	4.2
Total	236	100.0
Cancer Stage		
Stage I	16	6.8
Stage II	42	17.8
Stage III	56	23.7
Stage IV	98	41.5
None	23	9.7
Missing	1	.4
Total	236	100.0
Pain Management Therapy		
Opioids	170	72.0
Marijuana	30	12.7
Opioids and marijuana	36	15.3
Total	236	100.0

Note. Total *N* = 236

The sample of 236 individuals was evaluated in the current study (*N* = 236) for cancer type. The majority of participants were experiencing breast or metastatic breast cancer (41.9%, *n* = 99), and 9.3% reported lung or metastatic lung cancer (*n* = 22). Additionally, 6.4% of participants reported lymphoma (*n* = 15), and 4.2% reported leukemia (*n* = 10). Other cancers reported were 37.7% (*n* = 89) of the participants. Displayed in Table 6 are the frequencies and percent statistics of participants' highest

reported cancer types. Frequency and percent statistics of all participant cancer types are reported in Appendix D.

Table 6

Frequency and Percent Statistics of Participants' Highest Reported Cancer Types

Demographic	Frequency (*n*)	Percent (%)
Cancer Type		
Breast / Metastatic Breast	99	41.9
Lung / Metastatic Lung	22	9.3
Lymphoma	15	6.4
Leukemia	10	4.2
Other	89	37.7
Missing	1	.4
Total	236	99.9

Note. Total $N = 236$

Purposive sampling is commonly used during nonprobability sampling when researchers are confident the data collected will represent the study population (Frankfort-Nachmias & Nachmias, 2014; StatPac, 2014). Although convenience sampling has limitations, social scientists use nonprobability sampling when a sampling population cannot be properly defined and when a sampling population list is unavailable (Frankfort-Nachmias & Nachmias, 2014). Zoëga et al. (2013) used a convenience sample of 150 participants, who had a diagnosis of cancer, in a cross-sectional, descriptive, and correlational study on opioid use and QOL. Peters (2013) used a small, convenience qualitative study to examine participant cannabis use as an alternative or reduction agent for traditional opiate medicines. Researchers used the WHOQOL-BREF to study the QOL of cancer patients with different (Mendes et al., 2014) and similar (Vaz et al., 2007) types of cancers using cross-sectional, convenience studies.

Purposive sampling sacrifices some degree of generalizability and results may not provide sufficient representation of the target population (Ellis, 1994; Frankfort-Nachmias & Nachmias, 2014). Use of purposive sampling allows a search for an approximate truth when obtaining a probability random sampling is prohibitive. Although the majority of participants were female, the purposive sampling methodology produced a sample of participants with various types of cancers represented in society.

Overall Quality of Life

The sample of 236 individuals was evaluated in the current study ($N = 236$) for overall QOL and health satisfaction. The top two categories concerning general QOL of participants were *good* (41.1%, $n = 97$) and *neither poor nor good* (33.5%, $n = 79$). Concerning, overall health satisfaction, the top three categories concerning general health satisfaction of participants were *dissatisfied* (42.8%, $n = 101$), *satisfied* (24.2%, $n = 57$), and *neither satisfied nor dissatisfied* (21.6%, $n = 51$). Frequency and percent statistics of participants' overall QOL and health satisfaction are displayed in Table 7.

Table 7

Frequency and Percent Statistics of Participants' Overall Quality of Life

Demographic	Frequency (*n*)	Percent (%)
Overall Quality of Life (Q11)		
Very poor	2	0.8
Poor	42	17.8
Neither poor nor good	79	33.5
Good	97	41.1
Very good	16	6.8
Total	236	100.0
Overall Health Satisfaction (Q12)		
Very dissatisfied	20	8.5
Dissatisfied	101	42.8
Neither satisfied nor dissatisfied	51	21.6
Satisfied	57	24.2
Very satisfied	7	3.0
Total	236	100.0

Note. Total $N = 236$

Analyses of Research Questions 1 and 2

Research Questions 1 and 2 (i.e., RQ^1 and RQ^2) were evaluated using ANOVA, planned contrasts, post hoc tests, and moderated ANOVA. Specifically, any significant differences in cancer patient's QOL between types of cancer pain management therapy (i.e., RQ^1) and whether those differences were significantly moderated by gender (i.e., RQ^2) were addressed. The dependent variable for RQ^1 and RQ^2 was cancer patient's QOL scores as measured by the 26-question version of the World Health Organization Quality of Life Survey (WHOQOL-BREF; Appendix A). Participants' QOL scores were measured by 24-items on similar 5-point standard intensity scales. Response parameters were 1 = *not at all/very poor/very dissatisfied/never*, 2 = *a little/slightly/poor/dissatisfied/seldom*, 3 = *a moderate amount/moderately/neither poor*

nor good/neither poor nor well/neither satisfied nor dissatisfied/quite often, 4 = *very much/mostly/good/well/satisfied/very often*, and 5 = *an extreme amount/extremely/completely/very good/very well/very satisfied/always*. These 24-items were combined to produce domain scores related to individual QOL.

The WHOQOL-BREF produces a participant profile with four domain scores (i.e., physical health, psychological, social relationships [social relations], and environment) and two individually scored items concerning overall QOL and health perception (Skevington et al., 2004). The four domain scores and two individually scored items are scaled in a positive direction and higher scores indicate greater QOL or overall health perception. Additionally, three negatively framed questions (i.e., research survey #13, #14, and #36 coded f1_4, f11_3, and f8_1, respectively; see Appendix E) of the WHOQOL-BREF were reversed before scoring per WHO (1997a) instructions. The breakdown of questions in each domain is displayed in Appendix F.

Following details in WHO (1997a) scoring guidelines, composite QOL scores were calculated for each participant for the four domains and overall measures. The two overall QOL and health-related WHOQOL-BREF survey questions were used for correlation identification. The summary results of the 24-domain-related WHOQOL-BREF survey questions were used as the dependent variable for RQ^1 and RQ^2. The independent variable for RQ^1 and RQ^2 were participants' cancer pain management (PM) therapy types including traditional prescription based (i.e., opioids), nontraditional based (i.e., cannabis), and a combination of traditional and nontraditional therapy types (i.e.,

opioids and cannabis). The moderating variable for RQ^2 was participants' gender (male and female). The SurveyMonkey format of all the questions is displayed in Appendix G.

Assumptions, Data Cleaning, and Conversion

The sample data of 236 participants were then cleaned and converted to evaluate RQ^1 and RQ^2. Frequency tests, outliers, and plots were checked before parametric assumptions were tested. No missing or unusual cases were uncovered. For the 24-items related to the four domains, a raw score was computed for each item in each of the four domains. The raw numbers were checked against the valid frequency ranges of each domain (i.e., physical health from 7 to 35, psychological from 6 to 30, social relationships from 3 to 15, and environment from 8 to 40; WHO, 1997a). All raw domain scores for each participant were within these valid ranges. These raw scores were then transformed into a 0 to 100 scale score for each participant concerning the four domains. The scale scores were used in the ANOVA computations.

The assumptions for conducting ANOVA analysis include independent observations, normal populations, and homogeneity of variance (Field, 2013; Laureate Education, 2009). Composite QOL scores were calculated for each participant by averaging case scores across the 24 domain-related WHOQOL-BREF survey items. Preliminary exploratory data analysis employed frequency, outliers, standardized skewness and kurtosis (i.e., *z*-test), normal Q-Q plots, histograms, box plots, and Shapiro-Wilk's (S-W) inspections/tests of normality (Field, 2013; Kim, 2013; Shapiro & Wilk, 1965). For the sample using the composite QOL score ($N = 236$), visual inspection of plots, skewness of -0.208 ($SE = 0.158$), kurtosis of 0.244 ($SE = 0.316$), and S-W test ($p >$

.05) all indicated normal distribution results. Because large sample sizes can lead to normal distribution results, variable-related groups should be analyzed when parametric tests are conducted (Field, 2013).

Similar exploratory data analysis was employed on the smaller variable-related groups using frequency, outliers, *z*-skewness and *z*-kurtosis, normal Q-Q plots, histograms, box plots, and S-W inspections tests of normality (Field, 2013; Kim, 2013; Shapiro & Wilk, 1965). Although ANOVA is not heavily dependent on the normal assumption when sample sizes are adequate (Mertler & Vannatta, 2013), the exploratory results on the smaller groups yielded results consistent with normality where sample sizes were large enough. In one case, the sample size was very small ($n = 2$), and skewness calculations require the sample to be greater than two (Zaiontz, 2014).

This one group (i.e., males using marijuana) did not hinder the case for normality. Extremely small samples ($n = 2$) have been used without objections for *t*-tests when the effect size is large (de Winter, 2013). Further, many studies using Likert-type scaled data are not normally distributed, and normalcy is commonly assumed even if the data are not normal (Likert, 1932; Westland, 2010). Whether the group (i.e., males using marijuana) is normal or not, it was assumed to be normally distributed. These results helped identify the sample of participants used in the ANOVA models for RQ^1 and RQ^2. Descriptive statistics and S-W scores of participants' overall composite QOL scores and by pain management therapy types and gender are displayed in Table 8.

Table 8

Descriptive Statistics and S-W Scores of Participants' Overall Composite QOL Scores and by Pain Management Therapy Type and Gender

Composite QOL by PM & Gender	*n*	Min	Max	Mean	S-W Sig.	Std. Dev.	Skewness	Kurtosis
Overall QOL	236	1.250	4.630	3.126	.644	0.570	-0.208	0.244
PM Types								
Opioids	170	1.250	4.250	3.089	.178	0.549	-0.368	0.247
Marijuana	30	2.000	4.630	3.347	.634	0.656	0.205	-0.418
Combination	36	1.750	4.210	3.119	.509	0.568	-0.496	0.211
Gender								
Male	32	2.46	4.250	3.319	.337	0.456	0.376	-0.325
Female	204	1.250	4.630	3.096	.686	0.581	-0.196	0.182
PM by Gender								
Opioids								
Male	20	2.460	4.250	3.356	.311	0.471	0.253	0.003
Female	150	1.250	4.210	3.053	.166	0.550	-0.390	0.172
Marijuana								
Male	2	2.670	3.500	3.083	N/A*	0.589	N/A*	N/A*
Female	28	2.000	4.630	3.366	.676	0.666	0.162	-0.449
Combination								
Male	10	2.790	4.080	3.292	.169	0.439	0.862	-0.521
Female	26	1.750	4.210	3.053	.364	0.605	-0.519	-0.195

* Skewness and kurtosis statistics require n > 2 (Zaiontz, 2014)
Note. Total $N = 236$

Normal Populations

The aforementioned parametric assumptions were tested before the two research questions were examined. Descriptive statistics of the dependent variable (i.e., QOL) assumptions of normality and homoscedasticity were analyzed. Standardized skew and kurtosis coefficients (i.e., skew and kurtosis divided by their standard errors resulted in *z*-

skew and *z*-kurtosis coefficients) were used to test the normality of distributions (Kim, 2013; Tabachnick & Fidell, 2014). When $N < 1{,}000$, Tabachnick and Fidell (2014) associate *z*-skew and z-kurtosis coefficients as non-normal if exceed the range between ± 3.29 ($p = .001$). Kim (2013) breaks down *N* values as small ($n < 50$), medium ($50 < n < 300$), and large ($n > 300$) sample sizes and specifies non-normal criteria accordingly (i.e., $\pm$ 1.96, $\pm$ 3.29, and n/a, respectively). Based on these previous criteria, evaluation of the *z*-skew and *z*-kurtosis coefficients resulted in no distributions that exceeded the critical ranges. Hence, the distributions were assumed to be normally distributed because the assumption of normality was not violated. Standardized skewness and kurtosis statistics of participants' composite QOL scores by pain management therapy types and gender are displayed in Table 9.

Table 9

Standardized Skewness and Kurtosis Statistics of Participants' Overall Composite QOL Scores by Pain Management Therapy Types and Gender

Quality of Life by PM Types	*n*	Skewness	Skew Std. Error	*z*-skew	Kurtosis	Kurtosis Std. Error	*z*-kurtosis
Overall QOL	236	-0.208	0.158	-1.32	0.244	0.316	0.772
PM Types							
Opioids	170	-0.368	0.186	-1.978	0.247	0.370	0.668
Marijuana	30	0.205	0.427	0.480	-0.418	0.833	-0.502
Combination	36	-0.496	0.393	-1.262	0.211	0.768	0.275
Gender							
Male	32	0.376	0.414	0.908	-0.325	0.809	0.402
Female	204	-0.196	0.170	-1.153	0.182	0.339	0.537
PM by Gender							
Opioids							
Male	20	0.253	0.512	0.494	0.003	0.992	0.003
Female	150	-0.390	0.198	-1.970	0.172	0.394	0.437
Marijuana							
Male	2	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
Female	28	0.162	0.441	0.367	-0.449	0.858	-0.523
Combination							
Male	10	0.862	0.687	1.255	-0.521	1.334	-0.391
Female	26	-0.519	0.456	-1.138	-0.195	0.887	-0.220

*Skewness and kurtosis statistics require $n > 2$ (Zaiontz, 2014)
Note. Total $N = 236$

Homoscedasticity

The variances of the dependent variable (i.e., QOL), across levels of the independent variables (i.e., pain management therapy and gender), were tested for equality of error variances using the Levene's test. Results indicated that no distributions violated the assumption of homogeneity of variance ($p > .05$). Specifically, Levene's test

for homogeneity of variance failed to detect any significant difference between the RQ^1 ($F[2,233] = 0.589$, $p = .556$) and RQ^2 ($F[5,230] = 0.753$, $p = .585$) group variances, which indicated equal variances. Because there was an equal distribution of error variances across levels of the independent variables, the assumption of homogeneity of variance was not violated. These results helped identify the sample of 236 cases used in the ANOVA models for RQ^1 and RQ^2 ($N = 236$). Table 10 contains the composite QOL Levine's test summary details for RQ^1 and RQ^2.

Table 10

Summary of Levene's Tests for Research Questions 1 and 2 (Composite QOL)

Research Question	Independent Variable	*F*	*df1*	*df2*	Sig. (*p*)
RQ^1	Pain Management Therapy	0.589	2	233	0.556
RQ^2	Pain Management Therapy and Gender	0.753	5	230	0.585

Note. Dependent variable = Composite quality of life score, total $N = 236$

Although normality and homogeneity of variance were evaluated using composite QOL scores for the participants and research-related groups, transformed domain scores (i.e., physical health, psychological, social relationships, and environment) related to the research-related groups were also analyzed. Overall the physical domain had the lowest mean domain score (42.45, $SD = .178$) and the environment domain had the highest mean domain score (63.37, $SD = .509$). Concerning *z*-skewness and *z*-kurtosis, all transformed overall domain scores and domain scores by pain management therapy type and gender indicated normal characteristics except the *z*-skewness for opioids in the environment domain (i.e., -3.468 exceeded ± 3.29 threshold). Results indicated that no distributions violated the assumption of homoscedasticity ($p > .05$) except for gender in the social

relations domain (F[1,234] = 4.815, p = .029 which is < .05). Homogeneity of variance tests for pain management therapy by gender in the marijuana group was not calculated (i.e., n was not > 2; O'Neill & Mathews, 2000). In sum, all values analyzed indicated normality, except the z-skewness for opioids in the environment domain, and homogeneity of variance, except for the gender group related to the social relations domain. Descriptive statistics of participants' overall transformed domain scores and by gender and pain management (PM) therapy type are displayed in Table 11. Levene's test scores based on transformed domain scores can be found in Table 12.

Table 11

Descriptive Statistics of Participants' Overall Transformed Domain Scores and by Pain Management Therapy Type and Gender

Transform Domain by PM Type & Gender	*n*	Min	Max	Mean	Std. Dev.	Skewness	Kurtosis	*z*-Skewness	*z*-Kurtosis
Trans Domain									
Physical	236	3.570	89.29	42.45	.178	0.361	-0.276	2.285	-0.873
Psychological	236	4.170	91.67	52.95	.634	-0.351	-0.158	-2.222	-0.500
Social Relations	236	0.000	100.0	51.31	.509	-0.111	-0.699	-0.703	-2.212
Environment	236	3.130	100.0	63.37	.509	-0.499	0.499	-3.158	-1.579
Domain by PM									
Physical									
Opioid	170	3.57	85.71	40.29	16.04	0.331	-0.311	1.780	-0.841
Marijuana	30	25.00	89.29	54.52	17.34	0.358	-0.775	0.838	-0.930
Combination	36	3.57	82.14	42.56	18.12	0.273	-0.357	0.695	-0.465
Psychological									
Opioid	170	4.17	87.50	51.42	17.31	-0.338	-0.182	-1.817	-0.492
Marijuana	30	25.00	91.67	60.97	17.07	-0.227	-0.877	-0.532	-1.053
Combination	36	4.17	87.50	53.47	18.41	-0.642	0.432	-1.634	0.563
Social Relations									
Opioid	170	0.000	100.0	49.75	21.42	-0.107	-0.804	-0.575	-2.173
Marijuana	30	8.330	100.0	58.06	24.12	-0.220	-0.795	-0.515	-0.954
Combination	36	0.000	91.67	53.01	22.37	-0.260	-0.041	-0.662	-0.053
Environment									
Opioid	170	3.13	96.88	64.17	16.19	-0.645	0.828	**-3.468**	2.238
Marijuana	30	28.13	100.0	60.83	18.75	0.236	-0.482	0.553	-0.579
Combination	36	18.75	93.75	61.72	14.76	-0.749	1.157	-1.906	1.507
Domain by Gender									
..Physical									
Male	32	21.43	85.71	50.11	15.51	0.300	-0.143	0.725	-0.177
Female	204	3.57	89.29	41.25	17.08	0.417	-0.218	2.453	-0.643
Psychological									
Male	32	20.83	87.50	58.72	15.89	-0.602	0.036	-1.454	0.044
Female	204	4.17	91.67	52.04	17.79	-0.307	-0.147	-1.806	0.434
Social Relations									
Male	32	16.67	91.67	51.56	18.51	0.351	-0.162	0.848	-0.200
Female	204	0.000	100.0	51.27	22.55	-0.146	-0.765	-0.859	-2.257
Environment									
Male	32	46.88	93.75	66.70	12.34	0.290	-0.300	0.700	-0.371
Female	204	3.13	100.0	62.85	16.81	-0.501	0.380	-2.947	1.121

Note. Total $N = 236$

Table 12

Summary of Levene's Tests for Research Questions 1 and 2 (Transformed Domain)

Research Question	Independent Variable	*F*	*df1*	*df2*	Sig. (*p*)
RQ[1]	Pain Management Therapy				
	Physical	0.665	2	233	0.515
	Psychological	0.118	2	233	0.889
	Social Relations	0.730	2	233	0.483
	Environment	1.406	2	233	0.247
RQ[2]	Gender				
	Physical	0.356	1	234	0.551
	Psychological	0.613	1	234	0.434
	Social Relations	4.815	1	234	**0.029**
	Environment	3.856	1	234	0.051
	Pain Management Therapy and Gender				
	Opioids				
	Physical	0.211	1	168	0.646
	Psychological	0.613	1	168	0.813
	Social Relations	4.815	1	168	0.515
	Environment	0.356	1	168	0.160
	Marijuana*	N/A*	-	-	N/A*
	Opioids and Marijuana				
	Physical	0.001	1	34	0.981
	Psychological	0.915	1	34	0.345
	Social Relations	2.930	1	34	0.096
	Environment	0.822	1	34	0.371

*Levene's tests require $n > 2$ (O'Neill & Mathews 2000)
Note. Dependent variable = transformed domain (tdom1, tdom2, tdom3, & tdom4); $N = 236$

The significant values could be related to the transformation process or relatively large sample size. According to Field (2013), skew and kurtosis significance tests should not be used in large samples because ambiguous results may occur. Because the significant *z*-skew (i.e., environment) and homogeneity of variance (i.e., social relations) results occurred in the two domains where no significant ANOVA results occurred (i.e., discussed in next section), no corrective data procedures were taken. Further, many

studies using Likert-type scaled data are not normally distributed, and the normalcy assumption is commonly taken even if the data are not normal (Likert, 1932; Westland, 2010). Additionally, the transformed domain data were calculated values per standardized and validated WHO procedures (Skevington, 2004; WHO, 1997a).

The four domains were also analyzed concerning reliability. The physical, psychological, and environment domains all had high reliabilities (all Cronbach's $\alpha \geq$ .80). The social relations domain had a lower reliability (Cronbach's α = .67). According to Field (2013), Cronbach's α values around 0.80 are considered good. Cortina (1993) cites values of at least 0.70 indicate internal consistency in many cases. Cronbach's α based on questions related to each domain can be found in Table 13.

Table 13

Summary of Cronbach's α *for Domain-related Questions*

Domain	N of Items*	Cronbach's α
Physical	7	0.824
Psychological	6	0.827
Social Relations	3	0.671
Environment	8	0.799

* Total of 24-domain-related questions

Results of Hypothesis 1

$H_0$1: Quality of life will not differ between cancer pain-management types.

H_a1: Quality of life will differ between cancer pain-management types.

In accordance with WHOQOL-BREF criteria, QOL is broken into four distinct domains (i.e., physical health, psychological, social relationships, and environment; WHO, 1997a). These four QOL dimensions have different numbers of corresponding questions, raw domain score ranges, and transformed scales (WHO, 1997a). Transformed

scores (i.e., from 1 to 100) were calculated for each participant and domain, where higher scores indicate a higher QOL per domain (WHO, 1997a). These transformed domain scores were quantitatively analyzed.

Using SPSS 23.0, ANOVA was conducted to assess if significant differences in cancer patient's QOL existed between types of pain management therapy (i.e., traditional [opioids], nontraditional [marijuana], and combination [opioids and marijuana]) for each domain. Analysis of transformed domain results indicated that significant differences in the QOL scores of participants between pain management types in the physical and psychological domains existed but not in the social relations and environmental domains. Specific relationships and details were identified using ANOVA, effect size, planned contrasts, and post hoc tests. Planned contrasts and post hoc tests allow multiple comparisons in order to determine whether groups differed from each other (Field, 2013; Mertler & Vannatta, 2013).

In the physical domain, several significant relationships were identified concerning pain management therapy. The between groups overall relationship was significant, $F(2, 233) = 9.446$, $p < .001$, partial $\eta^2 = .075$. Per Cohen's guidelines, partial eta-squared (partial η^2) effects can be small, moderate, and large (i.e., .0099, .0588, and .1379, respectively; as cited in Richardson, 2011); thus, effect size was moderate. Results of planned contrasts and post hoc tests helped identify significant results of the various pain management therapy options. Concerning planned contrasts, there was a significant difference between participants who used opioids and participants who used both marijuana and marijuana and opioids combined, $t(233) = 3.429$, $p = .001$. Further, there

was a significant difference between participants who used marijuana and participants who used both marijuana and opioids combined, $t(233) = -2.927$, $p = .004$.

Analysis of both Hochberg GT2 and Games-Howell post hoc tests confirmed previous significant results. Field (2013) recommends using the Hochberg GT2 when sample sizes are very different and using the Games–Howell if there is any doubt concerning homoscedasticity. Significant results were indicated for participants who used opioids and participants that used marijuana ($p < .001$ for both post hoc tests) and between participants that used marijuana and participants that used opioids and marijuana combined ($p = .011$ and $p = .022$, respectively for the two post hoc tests). Therefore, participants that used traditional (opioids) pain management therapy had a significantly lower physical QOL domain score ($M = 40.29$, $SD = 16.04$) as compared to those that received nontraditional pain management therapy (marijuana, $M = 54.52$, $SD = 17.34$). When opioid therapy use was compared to the combination of the two therapies (opioids and marijuana, $M = 42.56$, $SD = 18.12$), no significance difference was indicated ($p = .838$ and $p = .768$, respectively). However, when marijuana therapy was compared to the combination of the two therapies (opioids and marijuana), a significant difference was indicated ($p = .011$ and $p = .022$, respectively).

In the psychological domain, a significant relationship was also identified concerning pain management therapy. The between groups overall relationship was significant, $F(2, 233) = 3.839$, $p = .023$, partial $\eta^2 = .032$. Results of planned contrasts and post hoc tests helped identify significant results of the various pain management therapy options. Concerning planned contrasts, there was a significant difference between

participants who used opioids and participants who used both marijuana and marijuana and opioids combined, $t(233) = 2.285$, $p = .023$. In this domain, there was not a significant difference between participants who used marijuana and participants who used both marijuana and opioids combined, $t(233) = -1.715$, $p = .083$.

Analysis of both Hochberg GT2 and Games-Howell post hoc tests confirmed previous significant results. Significant results were indicated for participants who used opioids when compared to participants that used marijuana ($p = .018$ and $p = .020$, respectively). Therefore, participants that used traditional (opioids) pain management therapy had a significantly lower psychological QOL domain score ($M = 51.42$, $SD = 17.31$) as compared to those that received nontraditional pain management therapy (marijuana, $M = 60.97$, $SD = 17.07$). When opioid therapy use was compared to the combination of the two therapies (opioids and marijuana, $M = 53.47$, $SD = 18.40$) no significant difference was indicated ($p = .891$ and $p = .813$, respectively). In this domain, when marijuana therapy was compared to the combination of the two therapies (opioids and marijuana), no significant difference was indicated ($p = .229$ and $p = .208$, respectively).

In the social relations and environment domains, no significant relationships were identified concerning pain management therapy. The between groups overall relationship for the social relations domain was not significant, $F(2, 233) = 1.956$, $p = .144$. The between groups overall relationship for the environment domain was not significant, $F(2, 233) = 0.752$, $p = .473$. Therefore, the null hypothesis for RQ^1 was rejected. Quality of life in the physical and psychological domains for cancer patients surveyed significantly

differed between cancer pain management types. Table 14 displayed a model summary of the ANOVA analysis for Hypothesis 1 and planned contrasts and post hoc test analysis were displayed in Table 15.

Table 14

Model Summary of the ANOVA Analysis for Hypothesis 1

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig. (*p*)	Partial Eta Squared	Observed Power
Physical Transformed							
Corrected Model	5163.869	2	2581.934	9.446	< .001	0.075	0.979
Intercept	281707.5	1	281707.5	1030.631	< .001	0.816	1.000
Therapy	1.667	2	0.834	2.588	< .001	0.075	0.979
Error	63687.04	233	0.322				
Total	494094.4	236					
Corrected Total	68850.91	235					
Psychological Transformed							
Corrected Model	2337.636	2	1168.818	3.839	0.023	0.032	0.693
Intercept	410660.0	1	410660.0	1348.787	< .001	0.853	1.000
Therapy	2337.636	2	1168.818	3.839	0.023	0.032	0.693
Error	70940.60	233	304.466				
Total	734913.2	236					
Corrected Total	73278.23	235					
Social Relations Transformed							
Corrected Model	1880.138	2	940.069	1.956	0.144	0.017	0.403
Intercept	386052.3	1	386052.3	803.463	< .001	0.775	1.000
Therapy	1880.138	2	940.069	1.956	0.144	0.017	0.403
Error	111953.1	233	480.486				
Total	735069.4	236					
Corrected Total	113833.3	235					
Environment Transformed							
Corrected Model	400.757	2	200.378	.752	0.473	0.006	0.177
Intercept	520441.5	1	520441.5	1952.868	< .001	0.893	1.000
Therapy	400.757	2	200.378	.752	0.473	0.006	0.177
Error	62094.77	233	266.501				
Total	1010332	236					
Corrected Total	62495.53	235					

Note. Dependent variable = transformed domain (tdom1, tdom2, tdom3, & tdom4); $N = 236$

Table 15

Model Summary of Planned Contrasts and Post Hoc Test Analysis for Hypothesis 1

Source	Value of Contrast	*df*	Std. Error	*t*	Sig. (*p*)	Mean Diff	95% Lower	CI Upper
Physical Transformed								
Planned Contrasts								
Opioid vs Mar & Combined	16.495	233	4.810	3.429	0.001			
Marijuana vs Combined	-11.964	233	4.087	-2.927	0.004			
Hochberg Post Hoc Test								
Opioid vs Marijuana			3.274		< .001	-14.230	-22.10	-6.36
Opioid vs Combined			3.033		0.838	-2.265	-9.56	5.03
Marijuana vs Combined			4.087		0.011	11.964	2.14	21.79
Games-Howell Post Hoc								
Opioid vs Marijuana			3.397		< .001	-14.230	-22.51	-5.95
Opioid vs Combined			3.261		0.768	-2.265	-10.15	5.62
Marijuana vs Combined			4.375		0.022	11.964	1.46	22.47
Psychological Transformed								
Planned Contrasts								
Opioid vs Mar & Combined	11.601	233	5.076	2.285	0.023			
Marijuana vs Combined	-7.500	233	4.314	-1.739	0.083			
Hochberg Post Hoc Test								
Opioid vs Marijuana			3.455		0.018	-9.551	-17.86	-1.24
Opioid vs Combined			3.201		0.891	-2.051	-9.75	5.65
Marijuana vs Combined			4.314		0.229	7.500	-2.87	17.87
Games-Howell Post Hoc								
Opioid vs Marijuana			3.388		0.020	-9.551	-17.80	-1.31
Opioid vs Combined			3.205		0.813	-2.051	-10.13	6.03
Marijuana vs Combined			4.374		0.208	7.500	-3.00	18.00
Social Relations Transformed								
Planned Contrasts								
Opioid vs Mar & Combined	11.555	233	6.377	1.812	0.071			
Marijuana vs Combined	-5.046	233	5.419	-0.931	0.353			
Hochberg Post Hoc Test								
Opioid vs Marijuana			4.341		0.161	-8.301	-18.74	2.14
Opioid vs Combined			4.022		0.803	-3.254	-12.92	6.42
Marijuana vs Combined			5.419		0.728	5.046	-7.98	18.08
Games-Howell Post Hoc								
Opioid vs Marijuana			4.700		0.195	-8.301	-19.77	3.17
Opioid vs Combined			4.075		0.706	-3.254	-13.01	6.59
Marijuana vs Combined			5.771		0.658	5.046	-8.82	18.91

Note. Dependent variable = transformed domain (tdom1, tdom2, tdom3, & tdom4); $N = 236$

(*table continues*)

Source	Value of Contrast	*df*	Std. Error	*t*	Sig. (*p*)	Mean Diff	95% Lower	CI Upper
Environment Transformed								
Planned Contrasts								
Opioid vs Mar & Combined	-5.794	233	4.749	-1.220	0.224			
Marijuana vs Combined	0.885	233	4.036	0.219	0.827			
Hochberg Post Hoc Test								
Opioid vs Marijuana			3.233		0.660	3.339	-4.43	11.11
Opioid vs Combined			3.000		0.797	2.454	-4.75	9.66
Marijuana vs Combined			4.036		0.995	-0.885	-10.59	8.82
Games-Howell Post Hoc								
Opioid vs Marijuana			3.641		0.633	3.339	-5.55	12.23
Opioid vs Combined			2.755		0.648	2.454	-4.19	9.09
Marijuana vs Combined			4.215		0.976	-0.885	-11.04	9.27

Note. Dependent variable = transformed domain (tdom1, tdom2, tdom3, & tdom4); $N = 236$

Figure 7 displayed the transformed physical domain QOL score for each pain management therapy group. Participants that employed marijuana to manage pain reported higher levels of physical domain QOL ($M = 54.52$ [significant at $p < .05$]) compared to those that used either opioids or opioids and marijuana ($M = 40.29$, $M = 42.56$, respectively).

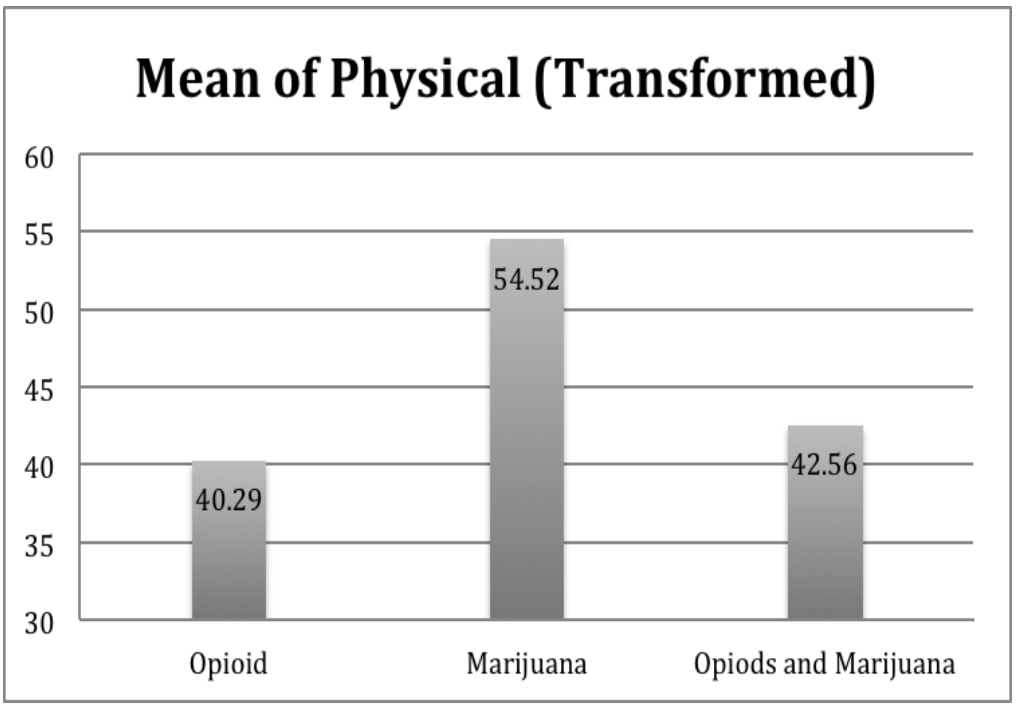

Figure 7. Transformed physical QOL across pain management therapy.

Figure 8 displayed the transformed psychological domain QOL score for each pain management therapy group. Participants that employed marijuana to manage pain reported higher levels of psychological domain QOL ($M = 60.97$ [significant at $p < .05$]) compared to those that used opioids ($M = 51.42$).

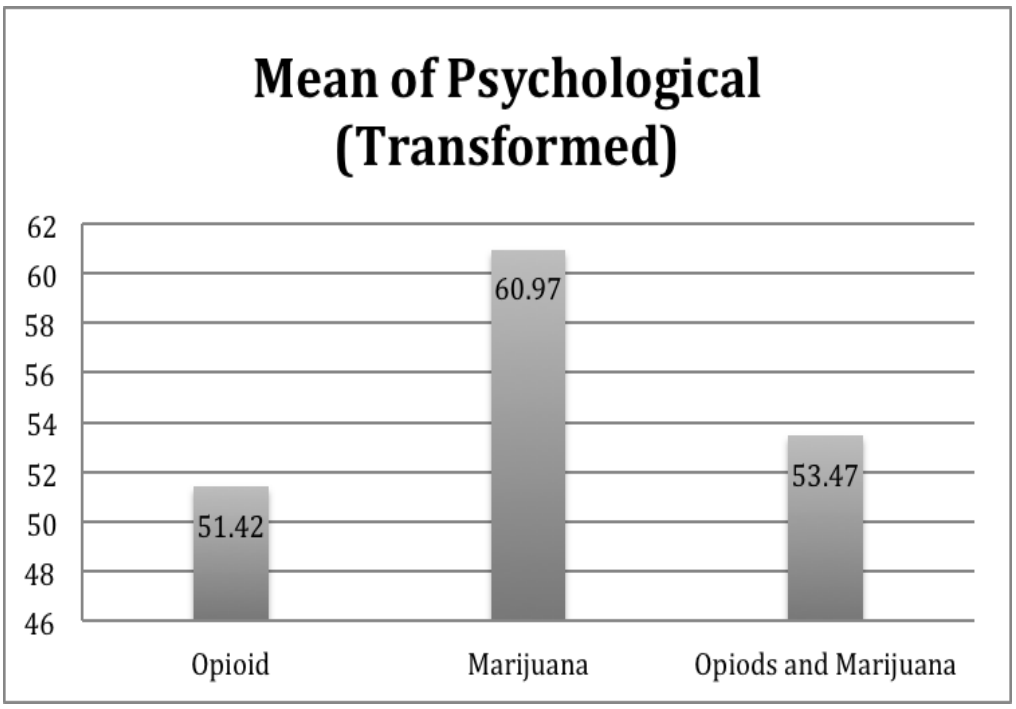

Figure 8. Transformed psychological QOL across pain management therapy.

Results found in $H_0$1 were compared to the two general WHOQOL-BREF questions concerning overall quality of life and health of the participants using ANOVA and post hoc tests. Analyzing the general QOL question (i.e., How would you rate your quality of life?) results, several significant relationships were identified concerning pain management therapy. The between groups overall relationship was significant, $F(2, 233) = 5.361$, $p = .005$, partial $\eta^2 = .044$. Results of post hoc tests helped identify significant results concerning participant use of the various pain management therapy options and the overall QOL question.

Analysis of both Hochberg GT2 and Games-Howell post hoc tests identified significant results. Significant results were indicated for participants who used opioids when compared to participants that used marijuana ($p = .004$ and $p = .003$, respectively)

and between participants that used marijuana when compared to participants that used opioids and marijuana combined (p = .042 and p = .048, respectively). Participants that used traditional (opioids) pain management therapy had a significantly lower overall QOL score (M = 3.28, SD = 0.85) as compared to those that used nontraditional pain management therapy (marijuana, M = 3.83, SD = 0.79). When opioid therapy use was compared to the combination of the two therapies (opioids and marijuana, M = 3.31, SD = 0.98) no significant difference was indicated (p = .997 and p = .985, respectively). However, when marijuana therapy was compared to the combination of the two therapies (opioids and marijuana), a significant difference was indicated (p = .042 and p = .048, respectively). Therefore, participants that used marijuana had a significantly higher overall QOL perception than those participants that used either opioids or combined opioids and marijuana pain therapies.

Analyzing the general health question (i.e., How satisfied are you with your health?) results, one significant relationship was identified concerning pain management therapy. The between groups overall relationship was significant, $F(2, 233) = 5.653$, p = .004, partial η^2 = .046. Results of post hoc tests helped identify significant results concerning participant use of the various pain management therapy options and the overall health question.

Analysis of both Hochberg GT2 and Games-Howell post hoc tests identified significant results. Significant results were indicated for participants who used opioids when compared to participants that used marijuana (p = .003 and p = .001, respectively). Participants that used traditional (opioids) pain management therapy had a significantly

lower overall health score ($M = 2.60$, $SD = 1.00$) as compared to those that received nontraditional pain management therapy (marijuana, $M = 3.27$, $SD = 0.83$). When opioid therapy use was compared to the combination of the two therapies (opioids and marijuana, $M = 2.72$, $SD = 1.14$), no significant difference was indicated ($p = .879$ and $p = .822$, respectively). When marijuana therapy was compared to the combination of the two therapies (opioids and marijuana), no significant difference was indicated ($p = .084$ and $p = .071$, respectively). Therefore, participants that used marijuana had a significantly higher health perception than those participants that used opioids. A model summary of the ANOVA analysis for general QOL and health questions was displayed in Table 16 and post hoc test analysis in Table 17.

Table 16

Model Summary of the ANOVA Analysis for General QOL and Health Questions

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig. (*p*)	Partial Eta Squared	Observed Power
General QOL Question							
Corrected Model	7.998	2	3.999	5.361	0.005	0.044	0.838
Intercept	1619.258	1	1619.258	2170.669	0.005	0.903	1.000
Therapy	7.998	2	3.999	5.361	0.005	0.044	0.838
Error	173.811	233	0.746				
Total	2833.000	236					
Corrected Total	181.809	235					
General Health Question							
Corrected Model	11.348	2	5.674	5.653	0.004	0.046	0.858
Intercept	1101.137	1	1101.137	1096.953	< .001	0.852	1.000
Therapy	11.348	2	5.674	5.653	0.004	0.046	0.858
Error	233.889	233	1.004				
Total	1970.000	236					
Corrected Total	245.237	235					

Note. Dependent variable = General QOL and Health question scores; $N = 236$

Table 17

Model Summary of Post Hoc Test Analysis for General QOL and Health Questions

Source	Std. Error	Sig. (*p*)	Mean Diff	95% Lower	CI Upper
General QOL Question					
Hochberg Post Hoc Test					
Opioid vs Marijuana	0.171	0.004	-0.56	-0.97	-0.15
Opioid vs Combined	0.158	0.997	-0.03	-0.41	0.35
Marijuana vs Combined	0.214	0.042	0.53	0.01	1.04
Games-Howell Post Hoc					
Opioid vs Marijuana	0.159	0.003	-0.56	-0.94	-0.17
Opioid vs Combined	0.176	0.985	-0.03	-0.45	0.40
Marijuana vs Combined	0.218	0.048	0.53	0.00	1.05
General Health Question					
Hochberg Post Hoc Test					
Opioid vs Marijuana	0.198	0.003	-0.67	-1.14	-0.19
Opioid vs Combined	0.184	0.879	-0.12	-0.56	0.32
Marijuana vs Combined	0.248	0.084	0.54	-0.05	1.14
Games-Howell Post Hoc					
Opioid vs Marijuana	0.169	0.001	-0.67	-1.08	-0.26
Opioid vs Combined	0.204	0.822	-0.12	-0.62	0.37
Marijuana vs Combined	0.242	0.071	0.54	-0.04	1.13

Note. Dependent variable = General QOL and Health question scores; $N = 236$

The findings for overall QOL and health perceptions of participants were consistent with the findings for the QOL domain perceptions of participants. The physical and psychological domain findings indicated higher QOL perceptions in participants that used marijuana for pain management therapy when compared to participants that used opioids. Analysis of the general QOL and health questions ANOVA and post hoc tests results indicated a similar correlation. Interpreting both general questions indicated a higher QOL and health perceptions in cancer patients that used marijuana for pain management therapy when compared to cancer patients that used opioids.

Results of Hypothesis 2

$H_0$2: The impact of cancer pain-management type on quality of life is not moderated by gender.

H_a2: The impact of cancer pain-management type on quality of life is moderated by gender.

Hypothesis 2 was evaluated using moderation (i.e., PROCESS tool; Field, 2013; Hayes, 2013) to determine if gender significantly moderated the relationship between cancer patients' QOL and their pain management therapy types. In accordance with WHOQOL-BREF criteria, QOL was broken down into four distinct domains (i.e., physical health, psychological, social relationships, and environment; WHO, 1997a). These four QOL dimensions had different numbers of corresponding questions, raw domain score ranges, and transformed scales (WHO, 1997a). Transformed scores (i.e., from 1 to 100) were calculated for each participant and domain, where higher scores indicate a higher QOL per domain (WHO, 1997a).

These four transformed domain scores were quantitatively analyzed using the PROCESS tool. Concerning the transformed physical domain, results indicated that there were no significant differences between male and female participants and their pain management therapy types, $b = 3.749$, 95% CI [-3.884, 11.382], $t = .968$, $p = .334$. Concerning the transformed psychological domain, results indicated that there were no significant differences between male and female participants and their pain management therapy types, $b = 0.076$, 95% CI [-7.036, 7.188], $t = .021$, $p = .983$. Concerning the transformed social relations domain, results indicated that there were no significant

differences between male and female participants' and their pain management therapy types, $b = 4.827$, 95% CI [-3.803, 13.458], $t = 1.102$, $p = .272$. Concerning the transformed environment domain, results indicated that there were no significant differences between male and female participants and their pain management therapy types, $b = 1.660$, 95% CI [-3.959, 7.278], $t = .582$, $p = .561$.

The Null Hypothesis 2 was not rejected. The impact of cancer pain-management type on QOL was not moderated by gender. None of the four QOL domains indicated any significant differences between male and female participants and their pain management therapy types. A model summary of the moderated ANOVA analysis (i.e., PROCESS tool) for Hypothesis 2 was displayed in Table 18.

Table 18

Model Summary of the PROCESS Tool Analysis for Hypothesis 2

Source	Coeff	*SE*	*t*	Sig. (*p*)	LLCI	ULCI
Model Summary						
Transformed Physical						
Constant	42.578	1.117	38.131	< .001	40.378	44.778
Gender	-8.899	3.109	-2.862	0.005	-15.024	-2.774
Therapy	2.618	1.676	1.562	0.120	-0.684	5.920
Int_1	3.749	3.874	0.968	0.334	-3.884	11.382
Transformed Psychological						
Constant	52.951	1.167	45.368	< .001	50.652	55.251
Gender	-6.178	3.318	-1.862	0.064	-12.715	0.359
Therapy	1.761	1.700	1.036	0.301	-1.588	5.110
Int_1	0.076	3.610	0.021	0.983	-7.036	7.188
Transformed Social Relations						
Constant	51.474	1.465	35.134	< .001	48.587	54.360
Gender	-0.481	3.986	-0.121	0.904	-8.334	7.373
Therapy	2.894	2.138	1.354	0.177	-1.319	7.105
Int_1	4.827	4.380	1.102	0.272	-3.803	13.458
Transformed Environment						
Constant	63.431	1.074	59.070	< .001	61.316	65.547
Gender	-4.693	2.621	-1.791	0.075	-9.856	0.471
Therapy	-1.654	1.469	-1.126	0.261	-4.548	1.240
Int_1	1.660	2.852	0.582	0.561	-3.959	7.278
Corrected Total	76.718	235				

Note. Dependent variable = transformed domain (tdom1, tdom2, tdom3, & tdom4); *N* = 236
Int_1 = Therapy * Gender
LLCI = Lower level confidence interval
ULCI = Upper level confidence interval

Summary

The purpose of the nonexperimental research was to determine the effects different types of cancer pain management treatments may have on cancer patients' QOL. Pain management therapies for cancer patients were defined by traditional (i.e., opioids),

nontraditional (i.e., marijuana, also known as cannabis), and combined nontraditional and traditional. Gender (i.e., male and female) was also examined to determine if it affected the difference in cancer patient pain management and QOL. Pain is a secondary health problem that many cancer patients suffer which may relate to their QOL (Shneerson et al., 2013). Pain management is an essential determinant of patient outcomes because unrelieved pain significantly comprised patient QOL and effective pain management was associated with patient survival (Perlman et al., 2013).

Research participants were reached through cancer and medical-related groups, SurveyMonkey Contribute program, and a cancer patient research firm. Data were collected from 617 individuals via SurveyMonkey, but 381 participants were removed from all analyses and a sample of 236 individuals was evaluated in the current study (N = 236). Using SPSS 23.0, this sample was analyzed for its various characteristics (e.g., gender, age group, education level, and cancer type and stage). Analysis of variance (ANOVA), planned contrasts, post hoc tests, and moderated ANOVA (i.e., PROCESS tool) were used to evaluate the two research questions.

Significant results concerning cancer patient QOL were indicated from some of the research tests. In accordance with WHOQOL-BREF criteria, QOL is broken down into four distinct domains (i.e., physical health, psychological, social relationships, and environment; WHO, 1997a). Concerning Research Question 1, results from the ANOVA indicated significant differences in the QOL scores of cancer patients between pain management types in the physical and psychological domains but not in the social relations and environmental domains. In the physical domain, there was a significant

difference between cancer patients who used opioids and cancer patients who used marijuana ($p < .001$ for Hochberg GT2 post hoc test) and cancer patients who used marijuana and those that used marijuana and opioids combined ($p = .011$). In the psychological domain, there was a significant difference between cancer patients who used opioids and cancer patients who used marijuana ($p = .018$). Therefore, participants that used traditional (opioids) pain management therapy had a significantly lower physical and psychological QOL domain score as compared to those that used nontraditional pain management therapy (marijuana). Further, participants that used marijuana and opioids combined pain management therapy had a significantly lower physical QOL domain score as compared to those that used marijuana pain management therapy. Results from Research Question 2 indicated that there were no significant differences between the four domains of QOL for male and female cancer patients and their pain management therapy types (i.e., physical health [$p = .334$], psychological [$p = .983$], social relations [$p = .272$], and environment [$p = .561$]). Displayed in Table 19 are summary details of the results for Research Questions 1 and 2.

Table 19

Summary of Results for Research Questions 1 and 2

Research Question	Dependent Variable/Domain	Independent Variable	Moderator	Analysis	Sig. (*p*)*
RQ[1]	Quality of Life	Pain Management Type		ANOVA	
	Physical				
		Opioid vs Marijuana			< .001
		Opioid vs Combined			0.838
		Marijuana vs Combined			0.011
	Psychological	Opioid vs Marijuana			0.018
		Opioid vs Combined			0.891
		Marijuana vs Combined			0.229
	Social Relations				
		Opioid vs Marijuana			0.161
		Opioid vs Combined			0.803
		Marijuana vs Combined			0.728
	Environment				
		Opioid vs Marijuana			0.660
		Opioid vs Combined			0.797
		Marijuana vs Combined			0.995
RQ[2]	Quality of Life	Pain Management Type	Gender	Moderated ANOVA	
	Physical				0.334
	Psychological				0.983
	Social Relations				0.272
	Environment				0.561

Note. $N = 236$
*Hochberg GT2 post hoc test result

These results indicated a different dimension to previous research concerning use of opioids and/or marijuana and cancer patient pain management. Previous studies have been conducted concerning advanced cancer pain, opioids, and adjuvant use of various cannabinoid formulations (Johnson et al., 2013; Portenoy et al., 2012). Adjunct use of the

THC/CBD oromucosal spray (i.e., Sativex®) along with opioids indicated improvements in pain in both short and long-term studies for both noncancer and cancer pain (Hoggart et al., 2015; Johnson et al., 2013; Portenoy et al., 2012; Serpell et al., 2014). Further, the substitution of cannabis for prescription drugs occurred in 80.3% of participants and the highest rated reason for conversion was pain-related conditions (Lucas et al., 2015). For chronic pain participants, cannabis reset opiate analgesia, decreased opiate dosage, and reduced pain levels experienced (Lucas, 2012). In this study, cancer patients who used marijuana indicated a higher QOL score in both physical and psychological domains as compared to those that used opioids. Cancer patients that used marijuana also indicated a significantly higher QOL when compared to cancer patients that used both opioids and marijuana combined in the physical domain scores. Results indicated that there were no significant differences between the four domains of QOL for male and female cancer patients and their pain management therapy types. This result was consistent with previous research that indicated mixed results concerning use and abuse of both opioids and marijuana when gender was considered (Greenfield et al., 2010).

In Chapter 5 of this study, an overview of the importance of this study and its contribution to the understanding of the topic will be provided. Specific findings, limitations, and recommendations based on the data analyses will be covered. Additionally, theoretical and future implications, including positive social change, and recommendations for future research will conclude the study.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of the nonexperimental research was to determine the effects different types of cancer pain management treatments may have on cancer patients' QOL. Pain management is an essential determinant of patient outcomes because unrelieved pain significantly comprised patient QOL and effective pain management was associated with patient survival (Perlman et al., 2013). Pain management therapies for cancer patients were defined by traditional (i.e., opioids), nontraditional (i.e., marijuana, also known as cannabis), and combined nontraditional and traditional. Gender (i.e., male and female) was also examined to determine if it affects the difference in cancer patient pain management and QOL. Gender provided a research opportunity because effects of opioid and marijuana on cancer patient QOL have not been evaluated under these conditions.

Significant results concerning cancer patient QOL were indicated from some of the research tests. In accordance with WHOQOL-BREF criteria, QOL is broken down into four distinct domains (i.e., physical health, psychological, social relationships, and environment; WHO, 1997a). Significant differences in the QOL scores of cancer patients were indicated between pain management types in the physical and psychological domains but not in the social relations and environmental domains. No significant differences were indicated between the four domains of QOL for male and female cancer patients and their pain management therapy types.

Interpretation of Findings

Many medical clinicians, researchers, and leaders agree that opportunities exist concerning the potential use of cannabis for pain (Savage et al., 2016). Patients with cancer-related pain may benefit from using cannabis and opioids complementarily (Johnson et al., 2013; Kral et al., 2015). Bowles et al. (2012) and van den Beuken-van Everdingen et al. (2016) noted a lack of data concerning various cannabis and conventional pain medications concerning cancer-related pain.

There are some studies indicating success with adjuvant cannabis use and cancer pain but further research is needed. In a short-term study, cannabis used in conjunction with opioids significantly reduced pain in participants, which may lower opioid doses and related side effects (Abrams et al., 2011). Significant improvements in pain were indicated in short and long-term studies related to cancer pain when using the THC/CBD spray (i.e., Sativex®; Johnson et al., 2013; Portenoy et al., 2012). Wilsey et al. (2013) demonstrated that low-dose (i.e., 1.29% THC), vaporized cannabis had a favorable risk-benefit ratio in the treatment of neuropathic pain in some patients. In a small sample of advanced cancer patients over a long-term period, level doses of a cannabis extract reduced the pain of participants when use of strong opioids alone had failed (Johnson et al., 2013). Further, participants displayed improvements in sleep outcomes throughout the complementary treatment period, and the cannabis treatment was well tolerated without increased safety concerns (Johnson et al., 2013). Because evidence suggests cannabis could be a safer alternative to or complement with opioids, further research is warranted

(Boehnke et al., 2016; Carter et al., 2015; Haroutounian et al., 2016; Joshi et al., 2014; Lucas, 2012; Lucas et al., 2015).

In the present study, ANOVA, planned contrasts, post hoc tests, and moderated ANOVA (i.e., PROCESS tool) were used to evaluate the two research questions. Concerning the first research question, cancer patients who used marijuana indicated a significantly higher QOL score in both physical and psychological domains as compared to those that used opioids. Cancer patients that used marijuana also indicated a significantly higher QOL score when compared to cancer patients that used both opioids and marijuana combined in the physical domain. There were no significant differences between cancer patients using opioids, marijuana, or combined opioids and marijuana therapies in either the social relations or environment domains. See Appendix F for a list of domain questions, scaling, and scoring criteria.

Concerning the second research question, results indicated that there were no significant differences between the four domains of QOL for male and female cancer patients and their pain management therapy types. The gender-related results were consistent with previous research that indicated mixed results concerning use and abuse of both opioids and marijuana when gender was considered (Greenfield et al., 2010). My research was focused on pain therapy (i.e., use of opioids and/or marijuana) and cancer patient QOL and indicated consistent findings with previous research while a somewhat unexplored dimension was also uncovered.

Previous studies have primarily focused on advanced cancer pain, opioids, and adjuvant use of various cannabinoid formulations (Johnson et al., 2013; Portenoy et al.,

2012). Adjunct use of the THC/CBD oromucosal spray (i.e., Sativex®) along with opioids indicated improvements in pain in both short and long-term studies for both noncancer and cancer pain (Hoggart et al., 2015; Johnson et al., 2013; Portenoy et al., 2012; Serpell et al., 2014). Very few studies have compared cancer patient QOL and opioid, marijuana, and combined opioid and marijuana criteria. In this study, cancer patients that used marijuana indicated a significantly higher QOL when compared to cancer patients that used both opioids and opioids and marijuana combined in the physical domain.

The self-assessment of the physical domain included seven questions, and the psychological domain included six questions. The self-assessments concerning the physical and psychological domains cover many areas. Questions in the physical domain covered physical pain, need for treatment, energy levels, mobility, sleep, performance of activities, and capacity for work criteria. Questions in the psychological domain covered life enjoyment, meaningful life, concentration, bodily appearance, satisfaction with self, and negative feelings criteria. Cancer patients using cannabis scored significantly higher in both of these QOL domains when compared to opioid users. Many of the physical and psychological domain questions could be related to the overall perception of well-being of individuals and the efficacy and side effects of current treatments. (Keogh et al., 2013; WHO, 1997b). See Appendix F for a list of domain questions, scaling, and scoring criteria.

Cohen et al. (2016) suggested comparing the efficacy and side effects of cannabis to opioids in future pain management studies. Many clinical studies have been

accomplished concerning opioid administration and noncancer and cancer pain management. Some studies have been accomplished concerning cannabinoid products, noncancer pain, cancer pain, and related QOL for patients. Further, the substitution of cannabis for prescription drugs occurred in 80.3% of participants and the highest rated reason for conversion was pain-related conditions (Lucas et al., 2015). For chronic pain participants, cannabis reset opiate analgesia, decreased opiate dosage, and reduced pain levels experienced (Lucas, 2012).

Some recently published research results correlate with my findings. Goldenberg, Reid, IsHak, and Danovitch (2017) conducted a systematic review and meta-analysis of 20 cannabis and cannabinoid studies, from 2004 to 2014 for over 2,400 participants, concerning health related QOL. Goldenberg et al. included eight pain-related studies that indicated a weakly positive relationship between cannabis-related treatments and QOL. Corroon, Mischley, and Sexton (2017) studied 2,774 cannabis users in Washington State and found 35.8% of participants substituted cannabis for opioids. Shi (2017) studied State Inpatient Databases from 1997 to 2014 and found significant reductions in opioid related hospitalizations (i.e., due to dependence, abuse, and/or overdose) in states where medical marijuana was legal. In a study of 271 Canadian medical marijuana patients, Lucas and Walsh (2017) found 32% self-reported using cannabis as a substitute for opioids, and 73% used cannabis for chronic pain symptoms. Further, cannabis was perceived to *often* or *always* help relieve symptoms in 95% of participates, and 77% of participants reported different strains of cannabis may not be *equally effective* (Lucas & Walsh, 2017).

My research incorporated the pain management preferences of cancer patients and the relationship to their QOL as measured in four domains (i.e., physical, psychological, social relations, and environment) using the HBM theoretical framework. According to Paice et al. (2016), each cancer survivor has unique needs because no two cancers are the same and patients have different capabilities, perspectives, and experiences. Concerning the optimal pain management treatment for cancer pain, the personal situation and preference of patients should be primary factors (van den Beuken-van Everdingen et al., 2016).

The controversy concerning cannabis use for chronic and cancer pain is multifaceted. Medical professionals who have patients using cannabis for pain or other symptoms should educate themselves on existing cannabis research and monitor the side effects, symptoms, and impending effects on the QOL of their patients (Savage et al., 2016). Because there are many cannabis varieties and ways to intake the substance, patients must find the right dose for their condition and circumstances (Hazekamp et al., 2013). Specific dosing and recommendations concerning cannabis treatments are challenging because scientific studies concerning product variability, method of administration, effects, and side effects are lacking (Savage et al., 2016).

Limitations of the Study

There are several limitations to the theoretical framework and design of the study. The HBM does not account for personality traits and habitual schemas (e.g., extraversion, agreeableness, neuroticism, openness, or conscientiousness; Abraham & Sheeran, 2005; Davey, 2011). Abraham and Sheeran (2005) cite that HBM fails to account for many

environmental factors during personal decision-making. Researchers have consistently used the flexibility of the HBM, but this practice has led to a lack of standardization in interpreting results (Janz & Becker, 1984). This study used a comprehensive, summary measure for HBM (i.e., four QOL domains of the WHOQOL-BREF which includes physical, psychological, social relations, and environment factors) and does not evaluate the specific type or methodology of cannabis or opioid use in pain management choice. Badr et al. (2013) did not assess treatment or cancer type into their QOL study, which may limit the impact of various cancer types and treatment options causing a differential in participant QOL.

Extrinsic and intrinsic factor interactions are considered potential threats to validity (Frankfort-Nachmias & Nachmias, 2015). Selection-history is one such extrinsic threat factor (Frankfort-Nachmias & Nachmias, 2015). Because the WHOQOL-BREF has shown cross-cultural validity concerning QOL across the four measured domains (Skevington et al., 2004), the potential selection-history threat was countered. The current treatment phase of the participant could cause variability in QOL unrelated to pain management type (Oliveira et al., 2014). Such variability could warrant use of a more homogeneous sample concerning treatment (Oliveira et al., 2014). Because the reactions of cancer patients to various treatments are often related (Tazaki et al., 1998), it was assumed that the various treatment groups assessed would have similar treatment phase participants.

The participants in each pain management therapy group were examined corresponding to the cancer stage of each participant. A sample of 236 individuals was

evaluated in the current study ($N = 235$; one missing entry) for cancer stage of participant and pain management therapy group. The majority (43.5%, $n = 74$) of participants in the opioid group were Stage IV, and 26.5% ($n = 45$) were Stage III. Concerning the marijuana group, the majority of participants were Stage II (30%, $n = 9$), and 26.7% ($n = 8$) were Stage III. In the combined opioid and marijuana group, the majority (51.4%, $n = 18$) of participants were Stage IV, and 22.9% ($n = 8$) were Stage II. Frequency and percent statistics of participants' cancer stage and pain management therapy group are displayed in Table H1. Because both the opioid and combined opioid and marijuana groups had a majority of Stage IV participants, further examination was accomplished.

Analysis of variance (ANOVA) tests were conducted on cancer stage using transformed domain scores as the dependent variable. When comparing all the transformed domain scores by the cancer stage of the participants, there were no significant differences (except for the psychological domain between Stage II and Stage IV participants). In the psychological domain, Stage II participants had a significantly lower QOL domain score ($M = 46.83$, $SD = 20.43$) when compared to Stage IV participants ($M = 57.02$, $SD = 14.92$). Further, the Stage IV participants had greater QOL scores in all four transformed domains when compared to participants that were Stage I, II, and III. Descriptive statistics of participants' overall transformed domain scores and cancer stage were displayed in Table H2. Table H3 displayed a model summary of the ANOVA analysis for transformed domain scores and cancer stage. The model summary of post hoc test analysis for the psychological domain and cancer stage was displayed in Table H4.

The previous analysis provides support for original assumptions. The greater percentage of Stage IV participants in the opioid and combined opioid and marijuana groups and higher mean QOL scores of Stage IV participants over Stage I, II, and III participants did not seem to affect the overall research results. In general, the cancer stage of participants did not significantly affect domain scores. Each cancer survivor has unique needs because no two cancers are the same and patients have different capabilities and experiences (Paice et al., 2016). Cancer patients need long-term pain management options that are individualized and positively affect their QOL (Taverner, 2015).

Generalization of results to the greater population may be limited because a purposive sampling methodology was used (Frankfort-Nachmias & Nachmias, 2015). It was assumed that the targeted sample would be a representative sample of the population under study. The research survey was made available to over 20,000 cancer patients, but the population of millions of cancer patients made a true experimental methodology using random assignment prohibitive. Because the survey invitation targeted tens of thousands of cancer patients and confidence level to determine acceptance of the null hypothesis was set to .05, a case toward limited generalizability may be made. However, the correlational design does not support causal direction in variable relationships (Field, 2013).

Opioid and cannabis use for pain management offer a complex array of choices. There are multiple clinical guidelines concerning use of opioids (Caraceni et al., 2012) and hundreds of different cannabis strains and many different methods of consumption or use (e.g., smoking, vaporizing, oil, edible, and topical; Kral et al., 2015) for pain relief.

Given all of these possible variations, the assumptions were opioid and cannabis users have experimented with many of the possible types, strains, and methods available and have determined the options that best meet their situation. The personal preferences of cancer patients should be a vital factor in their own pain management therapies (van den Beuken-van Everdingen et al., 2016).

Cost and legality were not factored into the analysis. Two barriers to cannabis use include affordability and fear because prescription medications are typically subsidized in most medical insurance programs and cannabis is not widely accepted legally at various governmental levels (Lucas et al., 2015). Despite sending out the survey to over 20,000 cancer patients, the proportion of participants in the marijuana and combined marijuana and opioid groups was very small when compared to the opioid group. Without federally approved synthetic cannabis medications for pain, U.S. patients must self-fund cannabis-related products through legal state controlled dispensaries or illegally through other suppliers (Boehnke et al., 2016).

All of the above limitations and delimitations may constrain the research, findings, and conclusions. Overall, survey participation rate was approximately 1.5%. This low response percentage could be due to several factors. The survey was directed at cancer patients and was completely voluntary without any extrinsic incentive. Higher participation rates could be achieved if some appropriate level of incentive was given. Further, higher response rates from cancer patients using marijuana could be achieved by surveying individuals associated with university-related dispensaries. During the data

collection phase, I contacted one such dispensary, but this contact yielded no participation.

There were other factors that could affect findings. The QOL of participants was self-reported using a standardized instrument during a specific period of time. Although participants were asked to consider the last 2 weeks when taking the survey, the data collected only provided a static assessment of QOL. Although the specific cancer and stage of each participant were collected, the specific stage of treatment for each participant was not assessed. Specifically, some participants could have been undergoing chemotherapy or radiation treatments while other participants were in a pre- or post-treatment phase. Even though over 95% of participants reported suffering chronic pain, the exact level of pain each participant suffered was not assessed.

Participant data concerning state of residence, availability of pain management options, and other adjuvants or nonopioids used were also not collected. Each of these factors could influence the perceived QOL of participants and serve as possible covariates. All of these factors could be included in future studies.

Researchers have identified other barriers that have prevented research and acceptance of cannabis as a normal pain management therapy. According to Penington (2015), patients should be able to use cannabis to seek relief given proper medical recommendation and following state laws. Several barriers have prevented research and medical acceptance of marijuana. These barriers include the following: (a) political hesitancy and nonacceptance, (b) practitioner educational and training deficiencies, (c)

patient-practitioner communication breakdown, and (d) practitioner concern over opioid abuse and hesitancy to advocate marijuana (Carter et al., 2015).

Recommendations

Opioid and cannabis prescription and/or use for pain should focus on side effects, physical function, symptom management, possible addiction, and QOL of patients (Savage et al., 2016). Cannabis treatments have been modestly effective and safe treatments in chronic pain patients, but most studies have focused on noncancer pain vice cancer-related pain (Aggarwal, 2013). More high quality, large sample size, long-term exposure, and analgesic comparative assessments concerning pain relief and physical functioning are needed (Aggarwal, 2013; Degenhardt et al., 2015; Kahan, 2014). Results from this current study align with results from previous studies. The implications of this alignment drive recommendations for medical practitioners, researchers, and health policy-makers.

For Medical Practitioners

Specific dosing and recommendations concerning cannabis treatments are challenging because scientific studies concerning product variability, method of administration, effects, and side effects are lacking (Savage et al., 2016). There are only a few approved cannabinoid-related prescription medications on the market (i.e., dronabinol [Marinol®; synthetic THC], nabilone [Cesamet®; synthetic molecule similar to THC], and nabiximols [Sativex®; THC and CBD extract]; Savage et al., 2016). The small number of cannabis treatment options available are most likely due to the lack of clinical research, cost issues, inconsistent insurance coverage, little to no standardization

or guidance in use, and medical professional reluctance to support (Savage et al., 2016). Medical professionals should educate themselves on existing cannabis research and monitor the side effects, symptoms, and impending effects on the QOL of any patients using cannabis (Savage et al., 2016).

The controversy concerning cannabis use for chronic and cancer pain is multifaceted. In Canada, despite being a legal option, marijuana was often not prescribed for chronic noncancer pain due to the uncomfortableness of medical providers in using cannabis as a pain management option (i.e., only 23% prescribed; St-Amant et al., 2015). Opioids are one of the most commonly used medications for palliative pain but may be inappropriate for chronic noncancer pain because short-term vice long-term effectiveness and efficacy have been indicated (Manchikanti et al., 2010). Although concrete evidence concerning opioid safety and effectiveness in the treatment of chronic pain is inconclusive, opioids remain a reasonable and primary treatment option (Manchikanti et al., 2010). Ineffective long-term efficacy of opioids opens up opportunities to find solutions for the long-term pain management care and QOL enhancement for both noncancer and cancer patients.

In this current study, cancer patients that used marijuana for pain indicated significantly greater physical QOL over cancer patients that used opioids and combined opioids and marijuana. Cancer patients that used marijuana for pain indicated significantly greater psychological QOL over cancer patients that used opioids. Cancer patients deserve the best QOL possible. If medical marijuana is legal in your jurisdiction,

then seriously consider prescribing it for your cancer patients. Cancer patients should be free to use marijuana in accordance with their state jurisdictions.

For Researchers

Marijuana may be an effective substitute or adjunct treatment to prescription drugs; therefore, long-term studies using cannabis with comparative and efficacy emphasis are warranted to determine QOL implications (Lucas & Walsh, 2017). Cannabis could be a safe and effective treatment for chronic pain and serve as an alternative or complementary treatment to relieve society from the growing costs related to the opioid epidemic (Lucas, 2012). As results from this study indicated, cannabis should be pursued as a viable option for cancer patients to increase their QOL when dealing with chronic pain. Future researchers could examine cannabis concerning pain and side effects relief to better understand the analgesic effects and implications (Wilsey et al., 2013).

Cannabis dosing mechanisms and strain types are two variables that need further research. There is a lack of data concerning various cannabis use mechanisms (e.g., smoked, ingested, vaporized; Bowles et al., 2012; Schauer et al., 2016) and conventional versus unconventional pain medications concerning cancer-related non-neuropathic or neuropathic pain (Bowles et al., 2012). Cannabis strains differ in potency of THC and CBD levels, so fine-tuning the right treatment for specific situations can be very individualized (Savage et al., 2016). High-THC cannabis strains were associated with physical and mental side effects while high-CBD strains had less mental side effects

while associated with various types of pain relief (Savage et al., 2016). Research concerning the amounts of THC and/or CBD to use for pain treatments is also needed.

There are many opportunities for researchers to study marijuana concerning noncancer and cancer pain. Health self-assessments have shown to be reliable predictors of cancer patient QOL and can help medical providers assess symptoms and direct treatments (Mansano-Schlosser & Ceolim, 2012). Researchers should examine long-term effects of cannabis concerning strains, dosage, intake methods, side effects, analgesia, and overall health implications.

Pain management treatments are often correlated to the QOL of patients (Baek et al., 2013; Kwon et al., 2013; Wengström et al., 2014). Opioids are the primary treatment for chronic pain (Manchikanti et al., 2010) even though they have been associated with abuse, overdose, and death (Rowe & Caprio, 2013). Researchers should appeal to health policy-makers to loosen the legislative controls on cannabis in order to facilitate potential pain management treatment opportunities.

For Health Policy-makers

The current Schedule I status of cannabis has limited past and limits future research (Savage et al., 2016). Concerning cannabis, scientific evidence and political ideology often collide when efficacy, safety, individual choice, and public health are debated (Savage et al., 2016). Researchers have been affected by strict government control limiting funding, restricting cannabis supplies and types, and risks of criminal prosecution (Aggarwal, 2013; Savage et al., 2016). Although some medical associations and groups (e.g., Institute of Medicine [IOM], American Medical Association [AMA],

and American College of Physicians [ACP]) have supported reclassification of cannabis to enhance future studies, the Schedule I status remains (Aggarwal, 2013; Cohen 2009a, 2009b, 2010; DEA Denial of Petition to Initiate Proceedings to Reschedule Marijuana, 2016).

In order to allow appropriate research, marijuana should be rescheduled to less than a Schedule I drug. Results from this current study indicated cancer patients that used marijuana had a significantly greater physical and psychological QOL domain score than cancer patients that used opioids. Although health self-assessments have shown to be reliable predictors of cancer patient QOL and can help medical providers assess symptoms and direct treatments (Mansano-Schlosser & Ceolim, 2012), researchers need to conduct more long-term clinical trials using marijuana. These clinical trials are hindered due to the current Schedule I drug status of marijuana. Reducing the ramifications of the opioid epidemic and increasing cancer patient QOL are important issues for society. Legislators should reschedule marijuana to less than a Schedule I drug.

In the interim of reducing the Schedule I status of marijuana, federal policy-makers should pass legislation to protect state medical marijuana programs and enable research into the medicinal properties of marijuana. Current legislation (Compassionate Access, Research Expansion, and Respect States Act of 2017 [CARERS Act of 2017]) was recently introduced into both the U.S. House and Senate. This legislation would help protect state medical marijuana laws from federal interference (i.e., even for veterans through the U.S. Department of Veterans Affairs) and enable marijuana research (H.R. 2920, 2017; S. 1374, 2017). Medical marijuana laws have been passed in more than half

the U.S. states. Cancer patients should be free to use marijuana in accordance with their state jurisdictions without fear of federal interference and prosecution.

Implications for Social Change

Determining relationships between pain management methods and cancer patients' QOL may help to enhance lives and contribute to positive social change. The number of annual cancer cases worldwide will reach over 20 million in the next 15 years, and pain management and QOL for cancer patients are primary concerns to health providers and affected patients (Kwon et al., 2013; Pelayo-Alvarez et al., 2013; WHO, 2015). New medical therapies hold the potential to create positive social change if they are found to provide significant benefit over current therapies (Benton et al., 2013). Pain management alternatives with less side effects, morbidity, or related mortality that provide patients equal or greater QOL could provide positive social value.

Overall, opioid related abuse, morbidity, and mortality have reached epidemic proportions in society (CDC, 2012, 2016; Garcia, 2013; Rowe & Caprio, 2013). Political obstacles and corporate influences (e.g., pharmaceutical industry) have created barriers for researchers studying cannabis (Bostwick, 2012; Cohen, 2009a, 2009b, 2010). These researchers have been excluded from participating in established drug testing protocols and processes (Bostwick, 2012; Cohen, 2009a, 2009b, 2010). As researchers examine evidence concerning pain management options, benefits, barriers, cues to action, and self-efficacy could be affected. The potential effects of medical interventions on psychological factors, such as QOL, have been inadequately studied, and assessment of cancer patients' QOL is a neglected research area (Barre et al., 2015).

Opioids are unreliable in predicting the response, tolerance, or superiority for each type on every patient (Prommer & Ficek, 2012). Due to insufficient evidence, cancer patients should help tailor their pain treatments with personal preferences (van den Beuken-van Everdingen et al., 2016). Even though many cancer patients used strong doses of opioids, the common occurrence of severe pain and decreased QOL indicated under treatment and presented an opportunity for future research (Zoëga et al., 2013).

Findings from my study could provide medical practitioners greater understanding of how pain management preference affects cancer patients' QOL and contribute to positive social change. Effective pain management is an essential determinant of patient QOL, outcome, and survival (Perlman et al., 2013). Many cancer patients suffer pain related symptoms and problems and these health related factors may correspond to their QOL (Shneerson et al., 2013). Cancer patients experienced significantly lower QOL with higher levels of pain; despite use of strong opioids, many cancer patients regularly encountered severe pain (Zoëga et al., 2013).

Because the majority of cancer patients take opioids for pain management and patients are often undertreated for pain (Nersesyan & Slavin, 2007; Tanco et al., 2014), individual pain management choice needs to be more personalized (Tanco et al., 2014). Enhancement of available pain management mechanisms of action that reduce negative side effects and improve patient QOL would provide significant benefit to society. Exploration into the under treatment of cancer pain is a necessity because improving cancer patient QOL is an important goal of health care (Zoëga et al., 2013).

The long-term effect of opioid use is mostly negative because only the minority of patients experience benefits (Becker et al., 2016). The negative consequences of long-term opioid use include safety issues (e.g., mild to severe toxicities), overdose, and death (Becker et al., 2016). The adverse effects of opioid use make it a poor long-term option (Hayes & Brown, 2014). In the majority of cases concerning opioid treatments, patients are either being undertreated and experience constant pain or over treated and experience various levels of harmful toxicity. Determining acceptable treatment alternatives to help balance these extreme situations could lead to policy changes and treatment options that could contribute to positive social change.

Research into substituting cannabis for or adjutant with opioids in pain-related cases is justified for public health reasons due to cannabis being a potentially safer mechanism of action (Lucas et al., 2015). The United States is a prime area of concern because its population typically consumes 80% of the world's opioid supply while having less than 5% of the global population (Manchikanti et al., 2010). Between 1999 and 2010, U.S. states with medical marijuana legislation had nearly a 25% lower mean annual rate of opioid overdose and mortality than states without such laws (Bachhuber et al., 2014). Potentially reducing the toxic effect of opioids on cancer patients should be a treatment consideration. A single focused strategy to decrease cancer patient pain without consideration of these toxic and potentially deadly side effects seems counterintuitive to overall patient QOL.

More pain management options and enhanced communication could provide solutions for cancer patients. The most effective cancer pain management decision-

making included collaboration between the medical providers and patients (Dalal et al., 2013; Paice et al., 2016). Each cancer survivor has unique needs because no two cancers are the same and patients have different capabilities and experiences (Paice et al., 2016). Cancer patients need long-term pain management options that are individualized and positively affect their QOL (Taverner, 2015). Opioids are a poor long-term option due to their adverse effects (Hayes & Brown, 2014). Due to the many problems, side effects, and complications associated with pharmacological treatments that decreased patient QOL, complementary and alternative treatments for pain management are needed (Park et al., 2015).

Complementary and alternative medicines (CAM) provide a challenge to practitioners providing conventional cancer treatment (Bar-Sela et al., 2015). Worldwide, CAM is used by 30-40% of cancer patients yet many of these therapies do not have evidence-based assessments of interactions with conventional treatments (Bar-Sela et al., 2015). A majority of cancer patients (i.e., 83%) would incorporate CAM into cancer treatments to supplement care (e.g., help improve QOL and reduce pain) if they were part of normal protocols (Ben-Arye et al., 2014). Shneerson et al. (2013), Bao et al. (2014), Ben-Arye et al. (2014), and Bar-Sela et al. (2015) explored CAM in cancer care and determined a relationship with expected and significant QOL improvement. Although all these researchers considered herbs in their studies, only Bao et al. (2014) included cannabis and found evidence of potential benefit for cancer pain. Further research concerning the efficacy and safety of CAM treatments are needed so medical providers

can counsel patients appropriately concerning integrative cancer care options (Bauml et al., 2015).

Cannabis prescriptions remain relatively low because information on potential side effects and effects, insurance coverage, cost, and medical provider advocacy are lacking (Savage et al., 2016). Cannabis was used primarily for pain, sleep, and anxiety problems although further research and familiarity were needed to connect therapeutic use with risk and benefit perceptions of participants (Walsh et al., 2013). In a small, convenience, qualitative study, Peters (2013) found some participants used cannabis as an alternative or reduction agent for traditional opiate medicines. Although most participants viewed cannabis as a less effective analgesic than strong opioids, many preferred cannabis over opiates due to reduced adverse side effects and increased QOL (Peters, 2013).

In other studies, cannabis has shown significant analgesic results, but the diversity in plant strain types and concentrations and lack of FDA guidance make specific efficacy and side effect predictions difficult (Savage et al., 2016). According to Hazekamp et al. (2013), although participants scored herbal nonpharmaceutical cannabis more satisfactorily than pharmaceutical cannabis products, patients are different and must find the right dose and application method for their situations. Further, there is a need to compare cannabis with the traditional pharmaceutical treatments (Walsh et al., 2013).

Cannabis may be an effective pain treatment to reduce opioid abuse and overdose (Boehnke et al., 2016). Because cannabinoid receptors are not on the brain stem, cannabinoid-based drugs may have an advantage over opioid-based drugs concerning

overdose potential (Lucas, 2012). The growing rates of opiate addiction, abuse, and mortality are public health concerns with significant social costs (CDC, 2016; Lucas, 2012; Rudd et al., 2016). These effects could impact social change at every level (i.e., individual, family, organizational, and society/policy).

Conclusion

There were significant findings from this research. Finding from this study indicated significant benefit in cancer patient physical and psychological QOL in participants using marijuana when compared to participants using opioids. Cancer patients that used marijuana also indicated a significantly higher QOL score when compared to cancer patients that used both opioids and marijuana combined in the physical domain. Because improving the QOL of cancer patients will contribute to positive social change, several recommendations for medical practitioners, researchers, and health policy-makers were presented.

Reducing the ramifications of the opioid epidemic and increasing cancer patient QOL are important issues for society. Concerning medical practitioners, if medical marijuana is legal in your jurisdiction, then seriously consider prescribing it for your cancer patients. Carter et al. (2015) identified various barriers related to medical practitioners incorporating cannabis into their standard of practice (i.e., political, educational, training, and communication). There are concerns with the current pain management approach (e.g., patient perception of intervention and patient-medical provider communication problems; Butow & Sharpe, 2013). Concerning the optimal pain management treatment for cancer pain, the personal situation and preference of patients

should be primary factors (van den Beuken-van Everdingen et al., 2016). Cancer patients should be free to use marijuana in accordance with their state jurisdictions.

Researchers and legislators should also take action. Researchers should examine the long-term effects of cannabis concerning strains, dosage, intake methods, side effects, analgesia, and overall health implications. Researchers should appeal to health policy-makers to loosen the legislative controls on cannabis in order to facilitate research into pain management treatment options. Legislators should reschedule marijuana to less than a Schedule I drug in order to empower researchers. In the interim of reducing the Schedule I status of marijuana, federal policy-makers should pass legislation to protect state medical marijuana programs and enable research into the medicinal properties of marijuana. Legislators should support the CARERS Act of 2017 that was recently introduced into both the U.S. House and Senate concerning these issues (H.R. 2920, 2017; S. 1374, 2017). Medical marijuana laws have been passed in more than half the U.S. states. Cancer patients should be free to use marijuana in accordance with their state jurisdictions without fear of federal interference and prosecution.

Cancer patients deserve the best QOL possible. Marijuana may be an effective substitute to opioids concerning physical and psychological QOL factors of cancer patients. I support IOM, AMA, and ACP perspective to reclassify marijuana to less than a Schedule I drug to enhance the ability of researchers to conduct future studies. The ineffective long-term efficacy of opioids opens up opportunities to find solutions for the long-term pain management care and QOL enhancement for both noncancer and cancer patients. Because pain endured and corresponding pain management treatments often

correlate to the QOL of patients (Baek et al., 2013; Kwon et al., 2013; Wengström et al., 2014), future pain management options in standard of care should incorporate research findings and evidence even if it counters political ideology.

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doi:10.1007/s11136-012-0264-x

Appendix A: WHOQOL-BREF

MSA/MNH/PSF/97.6
Page 16

I.D. number

ABOUT YOU

Before you begin we would like to ask you to answer a few general questions about yourself: by circling the correct answer or by filling in the space provided.

What is your **gender**? Male Female

What is you **date of birth**? _____ / _____ / _____
Day / Month / Year

What is the highest **education** you received?
None at all
Primary school
Secondary school
Tertiary

What is your **marital status**?
Single Separated
Married Divorced
Living as married Widowed

Are you currently **ill**? Yes No

If something is wrong with your health what do you think it is?_____illness/ problem

Instructions

This assessment asks how you feel about your quality of life, health, or other areas of your life. **Please answer all the questions.** If you are unsure about which response to give to a question, **please choose the one** that appears most appropriate. This can often be your first response.

Please keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life **in the last two weeks.** For example, thinking about the last two weeks, a question might ask:

		Not at all	Not much	Moderately	A great deal	Completely
	Do you get the kind of support from others that you need?	1	2	3	4	5

You should circle the number that best fits how much support you got from others over the last two weeks. So you would circle the number 4 if you got a great deal of support from others as follows.

		Not at all	Not much	Moderately	A great deal	Completely
	Do you get the kind of support from others that you need?	1	2	3	4	5

You would circle number 1 if you did not get any of the support that you needed from others in the last two weeks.

WHOQOL-BREF

The following questions ask how you feel about your quality of life, health, or other areas of your life. I will read out each question to you, along with the response options. **Please choose the answer that appears most appropriate.** If you are unsure about which response to give to a question, the first response you think of is often the best one.

Please keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life **in the last four weeks.**

		Very poor	Poor	Neither poor nor good	Good	Very good
1.	How would you rate your quality of life?	1	2	3	4	5

		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
2.	How satisfied are you with your health?	1	2	3	4	5

The following questions ask about **how much** you have experienced certain things in the last four weeks.

		Not at all	A little	A moderate amount	Very much	An extreme amount
3.	To what extent do you feel that physical pain prevents you from doing what you need to do?	5	4	3	2	1
4.	How much do you need any medical treatment to function in your daily life?	5	4	3	2	1
5.	How much do you enjoy life?	1	2	3	4	5
6.	To what extent do you feel your life to be meaningful?	1	2	3	4	5

		Not at all	A little	A moderate amount	Very much	Extremely
7.	How well are you able to concentrate?	1	2	3	4	5
8.	How safe do you feel in your daily life?	1	2	3	4	5
9.	How healthy is your physical environment?	1	2	3	4	5

The following questions ask about how completely you experience or were able to do certain things in the last four weeks.

		Not at all	A little	Moderately	Mostly	Completely
10.	Do you have enough energy for everyday life?	1	2	3	4	5
11.	Are you able to accept your bodily appearance?	1	2	3	4	5
12.	Have you enough money to meet your needs?	1	2	3	4	5
13.	How available to you is the information that you need in your day-to-day life?	1	2	3	4	5
14.	To what extent do you have the opportunity for leisure activities?	1	2	3	4	5

		Very poor	Poor	Neither poor nor good	Good	Very good
15.	How well are you able to get around?	1	2	3	4	5

		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
16.	How satisfied are you with your sleep?	1	2	3	4	5
17.	How satisfied are you with your ability to perform your daily living activities?	1	2	3	4	5
18.	How satisfied are you with your capacity for work?	1	2	3	4	5
19.	How satisfied are you with yourself?	1	2	3	4	5

20.	How satisfied are you with your personal relationships?	1	2	3	4	5
21.	How satisfied are you with your sex life?	1	2	3	4	5
22.	How satisfied are you with the support you get from your friends?	1	2	3	4	5
23.	How satisfied are you with the conditions of your living place?	1	2	3	4	5
24.	How satisfied are you with your access to health services?	1	2	3	4	5
25.	How satisfied are you with your transport?	1	2	3	4	5

The following question refers to how often you have felt or experienced certain things in the last four weeks.

		Never	Seldom	Quite often	Very often	Always
26.	How often do you have negative feelings such as blue mood, despair, anxiety, depression?	5	4	3	2	1

Do you have any comments about the assessment?

_____

_____

[The following table should be completed after the interview is finished]

		Equations for computing domain scores	Raw score	Transformed scores*	
				4-20	0-100
27.	**Domain 1**	(6-Q3) + (6-Q4) + Q10 + Q15 + Q16 + Q17 + Q18 ☐ + ☐ + ☐ + ☐ + ☐ + ☐ + ☐	a. =	b:	c:
28.	**Domain 2**	Q5 + Q6 + Q7 + Q11 + Q19 + (6-Q26) ☐ + ☐ + ☐ + ☐ + ☐ + ☐	a. =	b:	c:
29.	**Domain 3**	Q20 + Q21 + Q22 ☐ + ☐ + ☐	a. =	b:	c:
30.	**Domain 4**	Q8 + Q9 + Q12 + Q13 + Q14 + Q23 + Q24 + Q25 ☐ + ☐ + ☐ + ☐ + ☐ + ☐ + ☐ + ☐	a. =	b:	c:

* See Procedures Manual, pages 13-15

Appendix B: WHOQOL-BREF Permission

World Health Organization Quality of Life (WHOQOL) Instrument Order Form

US English Version Only

Your responses have been submitted. Your confirmation code is 6e1c7e286b7e9da83ad05e90b7500419

Please print this page for your records.

The instrument distribution coordinator will be contacting you soon to complete your order.

Thank you.

Thank you for your interest in the World Health Organization Quality of Life — BREF US English Version Instruments.

We distribute the WHOQOL-BREF U.S. English Version free of charge as electronic files.

Any questions can be directed to:

US WHOQOL Center
Attn: Instrument Distribution Coordinator
University of Washington, Department of Health Services
Box 359455
Seattle, Washington, USA 98195-9455
Phone: (800) 291-2193
Fax: (206) 616-3135
Email: seaqol@u.washington.edu

Although this information isn't required, we would also appreciate a short description of how you plan to use the instrument. The information would be used to enhance the effectiveness of future instruments or revisions.

Sincerely,
Instrument Dissemination Coordinator, US WHOQOL Center

Name (First, Last, Title):

John, Buhmeyer, Mr.

Today's Date:

February 16, 2016

Appendix C: SurveyMonkey Permission

SurveyMonkey

SurveyMonkey Inc.
www.surveymonkey.com

For questions, visit our Help Center
help.surveymonkey.com

Re: Permission to Conduct Research Using SurveyMonkey

To whom it may concern:

This letter is being produced in response to a request by a student at your institution who wishes to conduct a survey using SurveyMonkey in order to support their research. The student has indicated that they require a letter from SurveyMonkey granting them permission to do this. Please accept this letter as evidence of such permission. Students are permitted to conduct research via the SurveyMonkey platform provided that they abide by our Terms of Use, a copy of which is available on our website.

SurveyMonkey is a self-serve survey platform on which our users can, by themselves, create, deploy and analyze surveys through an online interface. We have users in many different industries who use surveys for many different purposes. One of our most common use cases is students and other types of researchers using our online tools to conduct academic research.

If you have any questions about this letter, please contact us through our Help Center at help.surveymonkey.com.

Sincerely,

SurveyMonkey Inc.

Appendix D: Frequency Counts of Participants' Cancer Types

Cancer Type	Frequency (*n*)	Percent (%)
Adenocarcinoma	1	0.4
Anal	2	0.8
Appendix	1	0.4
Bone	2	0.8
Brain	2	0.8
Breast	91	38.6
Breast and bone	1	0.4
Breast and colon	1	0.4
Breast and kidney	1	0.4
Breast and ovarian	2	0.8
Breast and skin	1	0.4
Breast, bone, and liver	1	0.4
Breast, skin, and rectal	1	0.4
Carcinoid	1	0.4
Cervical	5	2.1
Colon	5	2.1
Colon and liver	1	0.4
Colon and lymphoma	2	0.8
Esophageal	2	0.8
Endometrial	3	1.3
Gastrointestinal	1	0.4
Head and neck	4	1.7
Kidney	3	1.3
Leiomyosarcoma	4	1.7
Leukemia	2	0.8
Leukemia (AML)	3	1.3
Leukemia (CLL)	3	1.3
Leukemia (Myleofibrosis and ET)	1	0.4
Leukemia (SLL)	1	0.4
Liposarcoma	1	0.4
Liver	1	0.4
Lung	21	8.9
Lung and brain	1	0.4
Lymphoma	7	3.0
Lymphoma (Hodgkin)	1	0.4
Lymphoma (Non-Hodgkin)	5	2.1
Lymphoma and thyroid	1	0.4
Melanoma	1	0.4
Melanoma and ganglia nuero blastoma	1	0.4
Myeloma	9	3.8
Neuroendocrine	1	0.4
Oral	1	0.4
Ovarian	7	3.0

Ovarian and uterine	2	0.8
Pancreatic	6	2.5
Prostate	2	0.8
Rectal	4	1.7
Skin	3	1.3
Stomach	1	0.4
Testicle	1	0.4
Throat	1	0.4
Thyroid	3	1.3
Uterine	4	1.7
Vaginal	1	0.4
Vulvar	1	0.4
Missing	1	0.4
Total	236	100.0

Appendix E: WHOQOL-BREF 26-Question SPSS Coding and Question Numbers

WHOQOL-BREF Question#	Research Survey Question#	SPSS code	Question Text
1	11	g1	"How would you rate your quality of life"
2	12	g4	"How satisfied are you with your health"
3	13	f1_4	"To what extent do you feel pain prevents you from doing what you need to do"
4	14	f11_3	"How much do you need any medical treatment to function in your daily life"
5	15	f4_1	"How much do you enjoy life"
6	16	f24_2	"To what extent do you feel your life to be meaningful"
7	17	f5_3	"How well are you able to concentrate"
8	18	f16_1	"How safe do you feel in your daily life"
9	19	f22_1	"How healthy is your physical environment"
10	20	f2_1	"Do you have enough energy for everyday life"
11	21	f7_1	"Are you able to accept your bodily appearance"
12	22	f18_1	"Have you enough money to meet your needs"
13	23	f20_1	"How available to you is the information that you need in your day-to-day life"
14	24	f21_1	"To what extent do you have the opportunity for leisure activities"
15	25	f9_1	"How well are you able to get around"
16	26	f3_3	"How satisfied are you with your sleep"
17	27	f10_3	"How satisfied are you with your ability to perform your daily living activities"
18	28	f12_4	"How satisfied are you with your capacity for work"
19	29	f6_3	"How satisfied are you with yourself"
20	30	f13_3	"How satisfied are you with your personal relationships"
21	31	f15_3	"How satisfied are you with your sex life"
22	32	f14_4	"How satisfied are you with the support you get from your friends"
23	33	f17_3	"How satisfied are you with the conditions of your living place"
24	34	f19_3	"How satisfied are you with your access to health services"
25	35	f23_3	"How satisfied are you with your mode of transportation"
26	36	f8_1	"How often do you have negative feelings, such as blue mood, despair, anxiety, depression"

Appendix F: WHOQOL-BREF Domains, Questions, Scaling, and Scoring

Domain	Code and Question	Direction of Scaling	Raw Domain Score	Raw Item Score
Overall QOL and Health	g1 How would you rate your quality of life?	+	(2-10)	(1-5)
	g2 How satisfied are you with your health?	+		(1-5)
Domain 1 Physical Health	f1_4 To what extent do you feel that physical pain prevents you from doing what you need to do?	-(reverse)	(7-35)	(1-5)
	f11_3 How much do you need any medical treatment to function in your daily life?	-(reverse)		(1-5)
	f2_1 Do you have enough energy for everyday life?	+		(1-5)
	f9_1 How well are you able to get around?	+		(1-5)
	f3_3 How satisfied are you with your sleep	+		(1-5)
	f10_3 How satisfied are you with your ability to perform your daily living activities?	+		(1-5)
	f12_4 How satisfied are you with your capacity for work?	+		(1-5)
Domain 2 Psychological	f4_1 How much do you enjoy life?	+	(6-30)	(1-5)
	f24_2 To what extent do you feel your life to be meaningful?	+		(1-5)
	f3_1 How well are you able to concentrate?	+		(1-5)
	f7_1 Are you able to accept your bodily appearance?	+		(1-5)
	f6_3 How satisfied are you with yourself?	+		(1-5)
	f8_1 How often do you have negative feelings such as blue mood, despair, anxiety, depression?	-(reverse)		(1-5)

Domain 3 Social relationships	f13_3 How satisfied are you with your personal relationships?	+	(3-15)	(1-5)
	f15_3 How satisfied are you with your sex life?	+		(1-5)
	f14_4 How satisfied are with the support you get from your friends?	+		(1-5)
Domain 4 Environment	f16_1 How safe do you feel in your daily life?	+	(8-40)	(1-5)
	f22_1 How healthy is your physical environment?	+		(1-5)
	f18_1 Have you enough money to meet your needs?	+		(1-5)
	f20_1 How available to you is the information that you need in your daily-to-day life?	+		(1-5)
	f21_1 To what extent do you have the opportunity for leisure activities?	+		(1-5)
	f17_3 How satisfied are you with the condition of your living place?	+		(1-5)
	f19_3 How satisfied are you with your access to health services?	+		(1-5)
	f23.3 How satisfied are you with your mode of transportation?	+		(1-5)

(WHO, 1997a)

Appendix G: Research Questions (#2 – #38) in SurveyMonkey Format

WHOQOL-BREF+2 2017

About You (questions 2-10)

Before you begin we would like to ask you to answer a few general questions about yourself by selecting the correct answer or by filling in the space provided.

2. What is your gender?

- ◯ Male
- ◯ Female

3. What is your age group?

- ◯ 17 or younger
- ◯ 18 - 34
- ◯ 35 - 44
- ◯ 45 - 54
- ◯ 55 - 64
- ◯ 65 or older

4. What is the highest education you received?

- ◯ Less than High School
- ◯ High School
- ◯ Some College
- ◯ Bachelor's degree
- ◯ Graduate degree

5. What is your marital status?

- ◯ Single
- ◯ Married
- ◯ Living as Married
- ◯ Separated
- ◯ Divorced
- ◯ Widowed

3

6. Do you have cancer or have you had cancer?

- ◯ Yes
- ◯ No

7. Are you experiencing chronic pain?

- ◯ Yes
- ◯ No

8. What is your cancer type?

9. What is your cancer stage?

- ◯ I
- ◯ II
- ◯ III
- ◯ IV
- ◯ None

10. What pain management therapy do you use?

- ◯ Opioids
- ◯ Marijuana
- ◯ Opioids and Marijuana
- ◯ Neither

WHOQOL-BREF+2 2017

Quality of Life (questions 11-12)

Instructions

This questionnaire asks how you feel about your quality of life, health, or other areas of your life. Please answer all the questions. If you are unsure about which response to give to a question, please choose the one that appears most appropriate. This can often be your first response.

Please keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life in the last two weeks.

Please read each question, assess your feelings, and mark the answer on the scale that gives the best answer for you for each question.

11. How would you rate your quality of life?

Very Poor	Poor	Neither poor nor good	Good	Very Good
○	○	○	○	○

12. How satisfied are you with your health?

Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very Satisfied
○	○	○	○	○

WHOQOL-BREF+2 2017

Quality of Life (questions 13-19)

The following questions ask about how much you have experienced certain things in the last two weeks.

13. To what extent do you feel that physical pain prevents you from doing what you need to do?

Not at all	A little	A moderate amount	Very much	An extreme amount
○	○	○	○	○

14. How much do you need any medical treatment to function in your daily life?

Not at all	A little	A moderate amount	Very much	An extreme amount
○	○	○	○	○

15. How much do you enjoy life?

Not at all	A little	A moderate amount	Very much	An extreme amount
○	○	○	○	○

16. To what extent do you feel your life to be meaningful?

Not at all	A little	A moderate amount	Very much	An extreme amount
○	○	○	○	○

17. How well are you able to concentrate?

Not at all	Slightly	A moderate amount	Very much	Extremely
○	○	○	○	○

18. How safe do you feel in your daily life?

Not at all	Slightly	A moderate amount	Very much	Extremely
○	○	○	○	○

19. How healthy is your physical environment?

Not at all	Slightly	A moderate amount	Very much	Extremely
○	○	○	○	○

WHOQOL-BREF+2 2017

Quality of Life (questions 20-25)

The following questions ask about how completely you experience or were able to do certain things in the last two weeks.

20. Do you have enough energy for everyday life?

Not at all	A little	Moderately	Mostly	Completely
○	○	○	○	○

21. Are you able to accept your bodily appearance?

Not at all	A little	Moderately	Mostly	Completely
○	○	○	○	○

22. Have you enough money to meet your needs?

Not at all	A little	Moderately	Mostly	Completely
○	○	○	○	○

23. How available to you is the information that you need in your day-to-day life?

Not at all	A little	Moderately	Mostly	Completely
○	○	○	○	○

24. To what extent do you have the opportunity for leisure activities?

Not at all	A little	Moderately	Mostly	Completely
○	○	○	○	○

25. How well are you able to get around?

Very poor	Poor	Neither poor nor well	Well	Very well
○	○	○	○	○

WHOQOL-BREF+2 2017

Quality of Life (questions 26-35)

The following questions ask you to say howgood or satisfied you have felt about various aspects of your life over the last two weeks.

26. How satisfied are you with your sleep?

Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very Satisfied
○	○	○	○	○

27. How satisfied are you with your ability to perform your daily living activities?

Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very Satisfied
○	○	○	○	○

28. How satisfied are you with your capacity for work?

Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very Satisfied
○	○	○	○	○

29. How satisfied are you with yourself?

Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very Satisfied
○	○	○	○	○

30. How satisfied are you with your personal relationships?

Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very Satisfied
○	○	○	○	○

31. How satisfied are you with your sex life?

Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very Satisfied
○	○	○	○	○

32. How satisfied are you with the support you get from your friends?

Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very Satisfied
○	○	○	○	○

33. How satisfied are you with the conditions of your living place?

Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very Satisfied
○	○	○	○	○

34. How satisfied are you with your access to health services?

Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very Satisfied
○	○	○	○	○

35. How satisfied are you with your mode of transportation?

Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very Satisfied
○	○	○	○	○

WHOQOL-BREF+2 2017

Quality of Life (questions 36-38)

The follow question refers to how often you have felt or experienced certain things in the last two weeks.

36. How often do you have negative feelings, such as blue mood, despair, anxiety, depression?

Never	Seldom	Quite often	Very often	Always
○	○	○	○	○

37. Did someone help you to fill out this form?

- ○ Yes
- ○ No

38. How long did it take to fill out this form? (select the closest timeframe)

- ○ 5 minutes
- ○ 10 minutes
- ○ 15 minutes
- ○ 20 minutes or longer

Appendix H: Analysis of Participants' Cancer Stage by Pain Management Therapy

Table H1

Frequency and Percent Statistics of Participants' Cancer Stage and Type of Pain Management Therapy

Pain Management Therapy	Frequency (*n*) Opioids	[Percent (%)] Marijuana	Opioids & Marijuana
Cancer Stage			
Stage I	12 (7.1)	2 (6.7)	2 (5.7)
Stage II	25 (14.7)	9 (30.0)	8 (22.9)
Stage III	45 (26.5)	8 (26.7)	3 (8.6)
Stage IV	74 (43.5)	6 (20.0)	18 (51.4)
None	14 (8.2)	5 (16.7)	4 (11.4)
Total	170	30	35

Note. Total $N = 235$, one missing

Table H2

Descriptive Statistics of Participants' Transformed Domain Scores by Cancer Stage

Transform Domain by Cancer Stage	*N*	Mean	Std. Dev.
Physical			
None	23	38.66	19.28
Stage I	16	41.96	10.31
Stage II	42	40.56	18.16
Stage III	56	42.22	16.84
Stage IV	98	44.13	17.21
Psychological			
None	23	53.99	17.97
Stage I	16	50.78	12.66
Stage II	42	46.83	20.43
Stage III	56	50.60	19.76
Stage IV	98	57.02	14.92
Social Relations			
None	23	54.35	23.55
Stage I	16	51.56	21.99
Stage II	42	46.03	21.17
Stage III	56	49.40	23.62
Stage IV	98	53.49	20.72
Environment			
None	23	62.77	13.26
Stage I	16	63.87	13.45
Stage II	42	58.93	18.42
Stage III	56	61.05	19.45
Stage IV	98	66.65	14.00

Table H3

Model Summary of the ANOVA Analysis for Transformed Domain and Cancer Stage

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig. (*p*)	Partial Eta Squared	Observed Power
Physical Transformed							
Corrected Model	761.537	4	190.384	0.648	0.629	0.011	0.210
Intercept	272879.4	1	272879.4	928.29	< .001	0.801	1.000
Stage	761.537	4	190.384	0.648	0.629	0.011	0.210
Error	67610.48	230	293.959				
Total	489961.7	235					
Corrected Total	68372.02	234					
Psychological Transformed							
Corrected Model	3605.492	4	901.373	2.976	**0.020**	0.049	0.789
Intercept	425634.8	1	425634.8	1405.113	< .001	0.859	1.000
Stage	3605.492	4	901.373	2.976	0.020	0.049	0.789
Error	69671.25	230	302.918				
Total	731979.2	235					
Corrected Total	73276.74	234					
Social Relations Transformed							
Corrected Model	1880.138	2	940.069	1.956	0.144	0.017	0.403
Intercept	386052.3	1	386052.3	803.463	< .001	0.775	1.000
Stage	1880.138	2	940.069	1.956	0.144	0.017	0.403
Error	111953.1	233	480.486				
Total	735069.4	236					
Corrected Total	113833.3	235					
Environment Transformed							
Corrected Model	400.757	2	200.378	.752	0.473	0.006	0.177
Intercept	520441.5	1	520441.5	1952.868	< .001	0.893	1.000
Stage	400.757	2	200.378	.752	0.473	0.006	0.177
Error	62094.77	233	266.501				
Total	1010332	236					
Corrected Total	62495.53	235					

Note. Dependent variable = transformed domain (tdom1, tdom2, tdom3, & tdom4); $N = 235$

Table H4

Model Summary of Post Hoc Test Analysis for Psychological Domain and Cancer Stage

Source	Mean Diff	Std. Error	Sig. (*p*)	95% Lower	CI Upper
Psychological Transformed					
Hochberg Post Hoc Test					
None vs Stage I	3.2043	5.666	1.000	-12.80	19.21
None vs Stage II	7.1601	4.515	0.698	-5.60	19.92
None vs Stage III	3.3903	4.310	0.996	-8.79	15.57
None vs Stage IV	-3.0298	4.033	0.997	-14.42	8.36
Stage I vs Stage II	3.956	5.113	0.997	-10.49	18.40
Stage I vs Stage III	0.186	4.934	1.000	-13.75	14.13
Stage I vs Stage IV	-6.234	4.693	0.868	-19.49	7.026
Stage II vs Stage III	-3.770	3.553	0.966	-9.56	5.03
Stage II vs Stage IV	-10.190	3.210	**0.017**	-13.81	6.27
Stage III vs Stage IV	-6.420	2.916	0.250	-14.66	1.82
Games-Howell Post Hoc					
None vs Stage I	3.2043	4.904	0.965	-10.85	17.26
None vs Stage II	7.1601	4.896	0.591	-6.69	21.01
None vs Stage III	3.3903	4.583	0.946	-9.63	16.41
None vs Stage IV	-3.0298	4.038	0.943	-14.75	8.69
Stage I vs Stage II	3.956	4.467	0.901	-8.75	16.66
Stage I vs Stage III	0.186	4.121	1.000	-11.61	11.98
Stage I vs Stage IV	-6.234	3.505	0.410	-16.62	4.15
Stage II vs Stage III	-3.770	4.112	0.890	-15.23	7.69
Stage II vs Stage IV	-10.190	3.494	**0.038**	-20.01	-0.37
Stage III vs Stage IV	-6.420	3.040	0.224	-14.88	2.04

Note. Dependent variable = transformed psychological domain (tdom2); $N = 235$
No significant finding for physical, social relations, and environment domains were found; therefore, their post hoc test results were not displayed.