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The Use of Hydrotherapy for Chronic Pain

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THE USE OF HYDROTHERAPY FOR CHRONIC PAIN

by

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ABSTRACT

The purpose of this thesis is to provide a critical analysis of research findings about hydrotherapy as a means of reducing chronic pain used independently of opioids. Chronic pain is often treated with analgesics of varying potency, some with serious adverse side effects if used over a long period of time. Exploring the effectiveness of therapies other than medication to treat chronic pain is important to decrease or eliminate the amount to pain medication taken for chronic pain. Hydrotherapy is one therapy that may improve the pain experience for those with chronic pain. A literature search was conducted using the key terms chronic pain and hydrotherapy with the Cumulative Index of Nursing and Allied Health Literature database. This search yielded 5 studies that met the inclusion criteria, which were: research from 2015 or newer, studied adults over the age of 18, used hydrotherapy to reduce chronic pain who were not also using opioids, peer-reviewed, and written in the English language. The 5 studies found specifically addressed the conditions of osteoarthritis of the knee, fibromyalgia, and chronic low-back pain. All studies indicated hydrotherapy reduced chronic pain in adults. Findings of this analysis of the literature supports the recommendation to use hydrotherapy to improve chronic pain. Further research in other conditions known to cause chronic pain is needed.

DEDICATIONS

This thesis is dedicated to patients suffering from chronic, painful conditions. I hope the information gathered within this thesis provides an option that offers comfort from pain.

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Introduction

Medical advancements in pharmacology have created an environment that allows patients to ease pain with the simplicity of taking medication. Commonly, the medications used to ease chronic pain are morphine and oxycodone (Mayo Clinic, 2018). These drugs are highly addictive and dangerously abused (Center for Disease Control [CDC], 2018). In the United States (U.S.), approximately 218,000 people have died between 1999 to 2017 (CDC, 2018) due to overdose of their prescription opioids. That number translates to about 130 people dying per day in the U.S. as a result of opioid overdose. This crisis also affects the economic status of the U.S. costing an estimated $78.5 billion a year (National institute on Drug Abuse, 2019). To curb this crisis, medical institutions specializing in pain relief have started to organize new pain relief strategies that may decrease addiction (National institute on Drug Abuse, 2019). The goals of these organizations are to reduce opioid dependence and reduce pain in patients (National institute on Drug Abuse, 2019).

Pain

Pain is defined by the Mayo clinic as an emotional and physical event (2016). Pain can be acute, sub-acute, or chronic which translates to short-term or long-term pain (Mahjur, 2016). The well known McCaffery stated, “Pain is whatever the person experiencing the pain says it is” (McCaffery & Pasero, 1999, p.17). Furthermore, the International Association for the Study of Pain (IASP), defines pain as a, subjective experience that combines both sensory and emotional experiences (1994). These definitions emphasize that pain is an individualized experience. In order to accurately assess pain individually, healthcare teams will often use scales when probing patients regarding their pain (Jarvis, 2019).

Physiology of Pain

Pain is an essential sensory tool that alerts the body of a problem or potential problem (National Institute of Neurological Disorders and Stroke [NINDS], 2018). The sensation begins with nociceptors which are specialized receptors that trigger conversion of stimuli to electrical impulses sent to the spinal cord (NINDS, 2018). The impulses are received by the dorsal horn where they are evaluated before being sent to the thalamus within the brain (NINDS, 2018). The thalamus then distributes sensory signals to various brain regions to process the information and express it as pain (NINDS, 2018). Inside the brain regions, neurotransmitters communicate. Some of the neurotransmitters are: glutamate, gamma-aminobutyric acid, norepinephrine, serotonin and opioids (NINDS, 2018).

Chronic pain can be a chronic condition similar to a condition like diabetes or asthma (Mayo Clinic, 2016). It persists over a period of time and is often unaffected or unresolved by medical interventions (Mayo Clinic, 2016). Persistent pain is linked to the nervous system by a phenomenon called, neuronal plasticity (Sibille, Bartsch, Reddy, Fillingim, & Keil, 2016). Neuronal plasticity is defined by the U.S. National Library of Medicine National Institutes of Health as the nervous system responding to experience or injury by altering the way it functions (2017). Plasticity can sometimes take an unhealthy form when referring to chronic pain (NINDS, 2018). These functional changes sometimes occur as hypersensitivity and cause pro-longed pain after an injury has healed (NINDS, 2018).

There are several influencing factors surrounding pain. Some are: genetics, gender, long-term health problems, social factors, psychosocial factors, coping strategies, previous experiences

(Mayo Clinic, 2016). Mayo Clinic (2016) states that more women than men report pain and more severe pain. They also claim that long-term health problems are associated with pain.

Pain Assessment

Healthcare teams use various techniques to evaluate pain. Most adults experiencing pain are able to communicate, and communication becomes the primary mode of assessment (Jarvis, 2019). A common tool used by nurses to gather objective and subjective data is the PQRST method (Jarvis, 2019). Each letter of the mnemonic stands for a question that the nurse will ask the patient based on his/her pain. The letters stand for: Precipitating factors, Quality of pain, Region of pain, Severity of pain, Triggers and Timing of pain (Jarvis, 2019) Evidenced-based practice suggests that subjective scales are the best way to interpret the severity of pain (Jarvis, 2019). The two most commonly used scales are the numeric scale and the Wong-Baker Faces pain scale (Jarvis, 2019). These scales can work for verbal patients and for patients with some barriers to communication (Jarvis, 2019). If a patient is unable to verbally communicate, they could point to their pain rating or circle the appropriate rating. Healthcare teams also monitor facial expressions and for non-verbal cues when evaluating the severity of pain during assessment (Jarvis, 2019). While assessing non-verbal cues is vital to evaluating pain, it is also important to keep in mind that non-verbal cues are not sensitive to pain. Patients who are unable to speak may use facial expression to try and express their needs or something in their environment. This proves that scales rating pain levels are crucial to acquiring accurate assessments.

Treatment of Pain

There is no single treatment for chronic pain, but the first step should be to treat any existing underlying conditions (Cleveland Clinic, 2015). The most common method of treating chronic

pain is through the use of analgesics (Cleveland Clinic, 2015). Analgesics are divided into two categories: non-steroidal anti-inflammatory (NSAIDS), and opioids. NSAIDS work by blocking pain at the site of inflammation while opioids block the sensation of pain in the brain and in the spinal cord (Cleveland Clinic, 2015).

Other pharmacological means of pain relief are antidepressants, anticonvulsants, and sedatives (Cleveland Clinic, 2015). Antidepressants work with the same chemicals responsible for the sensation pain (Cleveland Clinic, 2015). They may also serve beneficial if the chronic pain has led to instability in mental health (Cleveland Clinic, 2015). Nerve injuries are a form of neuropathic conditions that often are accompanied by pain which can be treated with anticonvulsants (Cleveland Clinic, 2015). If chronic pain is causing anxiety or insomnia, it is not uncommon for sedatives to be prescribed to counter these effects (Cleveland Clinic, 2015).

Another option for chronic pain relief is non-pharmacological interventions (Cleveland Clinic, 2015). Non-pharmacological pain relief can be achieved independently or in conjunction with drug therapy (Cleveland Clinic, 2015). Examples of non-pharmacological interventions are activities such as exercise, massage, acupuncture or hydrotherapy (Cleveland Clinic, 2015). These techniques are relevant because they can be performed without a provider's order.

Problem

This paper will focus on adults with long-term health conditions suffering from chronic pain. Recent studies estimate that 20% of the population in the developed world suffer from chronic pain (Park & Moon, 2010). Of that 20%, around 21-29% abuse their prescribed opioids (National Institute on Drug Abuse [NIDA], 2019). A general trend of greater than 50% increase of overdose cases has occurred in midwestern states and large cities between 2016-2017 (NIDA, 2019).

The consequences of opioid abuse are numerous. Some of which are neonatal abstinence syndrome, increased Human Immunodeficiency Virus (HIV) diagnoses, increased Hepatitis B diagnoses and even death (NIDA, 2019). People who use opioids for pain management are at a greater risk for building tolerance and then seeking higher doses or more potent medications to get the same effect (NIDA, 2019). Opioids can help patients, but they also have a great risk of harm and addiction. Therefore, research and assessment of non-pharmacological pain relief to manage pain is critical in decreasing chronic pain and the potential for opioid abuse complications that comes from taking opioids over an extended period of time (NIDA, 2019).

Purpose

The purpose of this this literature review is to critically analyze research related to the use of hydrotherapy as a means of a non-pharmacological pain intervention used independently of opioids to reduce chronic pain. Information concluded from this study may inform further research and exploration. This literature review may also provide healthcare providers with data to help patients achieve pain relief.

Method

A synthesis of the current research about non-pharmacological pain relief for adults was conducted for this thesis. An interdisciplinary review was performed using PubMED and peer-reviewed research journals from the Cumulative Index of Nursing and Allied Health Literature (CINAHL) database. Inclusion criteria for this thesis consisted of research focused on adults (>18 years of age) with long-term health conditions: fibromyalgia, osteoarthritis, and peer-reviewed journal articles limited to publication from 2015 through the present written in the English language.

Background

Description of Interventions

Hydrotherapy was first used by the Greeks in the form of water spas and exercise programs (Johnson, 2011). The North American Spine Society defines hydrotherapy as the use of water to treat physical or psychological dysfunction. This rehabilitation technique has proved beneficial and effective for treating a variety of diagnoses including patients with cardiovascular disorders, pulmonary disorders and musculoskeletal disorders (Johnson, 2011). During hydrotherapy the body experiences increased buoyancy which allows for decrease weight bearing on joints, increased blood flow, and decreased edema (Johnson, 2011). An increase in blood flow will decrease the heart rate and blood pressure allowing for a lesser demand on the body while improving functionality (Johnson, 2011).

Pain Assessment

The studies in this literature review used various methods to objectively evaluate pain reduction. The samples in the reviewed studies were verbal and literate adults who were able to self-report their pain. Many of the studies utilized questionnaires to be completed before, during and after their course of hydrotherapy treatment. The use of visual analog scales was also used to determine specific levels of pain among participants.

Findings

Osteoarthritis of the Knee

Dias et al. (2017) studied the efficacy of hydrotherapy for decreasing pain related to women diagnosed with osteoarthritis of the knee. A randomized controlled trail was used for this study which included 65 women with a mean age of 70.8 years. The women were randomly divided into either a hydrotherapy group or control group. The women in the hydrotherapy group underwent a six-week program of exercise in a heated pool twice per week for 40-minute increments. Both the hydrotherapy group and control groups had an educational protocol. The educational protocol is the only activity required of the control group and consisted of information centered around the care of osteoarthritis of the knee. The experimental conditions for the heated pool were that the temperature of the water be kept at 32 degrees Celsius and the water level had to remain above or at the umbilicus of each participant. There were two sets of outcomes measured at the conclusion of this study: primary and secondary outcomes. Primary outcomes were related to pain and function assessed by the Western Ontario & McMaster Universities Osteoarthritis Index (WOMAC) questionnaire on a 0-100 scale. Secondary outcomes were related to knee flexion/extension measured by isokinetic dynamometer. Isokinetic dynamometers measure velocity of muscular contraction around joints. Calculating the magnitude of change between the hydrotherapy group and the control group was achieved using the linear regression model. Results of the WOMAC questionnaire demonstrated that the hydrotherapy group experienced a reduction of 11% in their pain level while the control group did not.

Rewald et al. (2016) studied whether aqua-cycling was a reasonable exercise program for people with knee-osteoarthritis to decrease pain. Participants included in this study consisted of a group of ten volunteers of both genders between the ages of 46-77. All participants trained in groups of three once a week in 45-minute intervals over the course of 8 weeks. The temperature of the pool water was maintained at 32 degrees Celsius. Participants were evaluated using standardized focus group interview questions before and after training as well as by using the numeric pain rating scale. Results showed that aqua-cycling reduced pain to a level of 3.18 ($p< 0.05$) from their pre-exercise pain level 4.09 associated with knee osteoarthritis.

Fibromyalgia

Fernandez, Jennings, Cabral, Buosi, and Natour (2016) studied the effect of swimming on function and pain for women with fibromyalgia. A randomized control trial was used for this study which included 75 women between the ages of 18-60. Women were randomly assigned to either a swimming group or a walking group. Both groups spent 50 minutes exercising 3 times per week for 12 total weeks. Heart rate of each participant was monitored during activity. The only pharmacologic aid permitted within the study was acetaminophen with a limit of 500mg up to 4 times per day. Six outcomes were obtained using: 10 cm line visual analog scale, fibromyalgia impact questionnaire, medical outcomes study 36-item short-form health survey, timed up and go test, spiroergometric test, and analgesic log. Results of this study showed no significant difference between the walking and swimming group ($P >0.05$). The visual analog scale demonstrated that over the course of the twelve-week exercise program, the pain level decreased by $p > .001$ for both the walking and swimming group. Therefore, swimming and

walking were both viable and safe methods for reducing pain and increasing function in women with fibromyalgia.

Avila et al. (2017) examined the effects of hydrotherapy in relation to motion and pain in women with fibromyalgia. Participants included 20 women who spent 16 weeks in the study with 2 sessions of hydrotherapy exercise in the pool lasting 45 minutes per week. Outcomes for this study focused on pain and quality of life. The methods used to analyze outcomes were the: fibromyalgia impact questionnaire, the Medical Outcomes Study 36-item Short Form Health Survey (SF-36), pressure pain threshold (PPT) and the numeric pain rating scale from 0-10. Pain was measured at week zero, at eight weeks and at 16 weeks. Results demonstrated statistically significant values. Pain related to arm motion was reduced at the conclusion of the study ($P < 0.01$) and overall pain was reduced ($P < 0.01$). Results demonstrated improvement in pain and quality of life ($P > 0.05$).

Chronic Low Back Pain

Sawant and Shinde (2019) compared hydrotherapy-based exercises to conventional physiotherapy through an experimental study. Participants of the study included 30 people between the ages of 20-45 years old of male or female gender diagnosed with non-specific low back pain. Participants were divided with random allocation into groups of 15. Within the two groups, participants were divided according to age into sub-groups such as 20-30, 31-40, and 41-50. Group A practiced conventional therapy which consisted of heating packs, exercise, and stretching. Group B spent a unspecified amount of time in water performing various stretching and strengthening exercises. Outcomes were measured from pre and post intervention values using the t-test analysis for visual analog scale, range of motion, MMT and MODI. The MMT

and MODI acronyms were not defined within the study. Results determined statistically significant data to support hydrotherapy as a mode to reduce non-specific chronic low-back pain (P – 0.0182)

Discussion

Osteoarthritis of the Knee

The reduction of chronic pain in patients with knee-osteoarthritis were analyzed using two research studies. Both research studies examined hydrotherapy as a non-pharmacological analgesia for decreasing chronic osteoarthritis knee pain and found statistically significant evidence to support hydrotherapy as a safe and effective mode of pain relief. The studies did however differ in several variables such as sample size, gender, duration of exercise, and their approaches to facilitating the study. Dias et al. (2017) had only females participate in his 40-minute hydrotherapy exercise which contained warm-up and cool-down time allotment, while Rewald et al. (2016) had a mixture of males/females for a hydrotherapy exercise that lasted 45 minutes but still contained time allotment for warm-up and cool-down. Both strategies offered techniques to reduce pain in patients with chronic pain related to knee-osteoarthritis.

Fibromyalgia

Both research articles studied hydrotherapy as a mode to decrease chronic pain in women with fibromyalgia found statistically significant evidence to support it as a safe and effective technique. However, both studies varied in how hydrotherapy was applied to participants and how their outcomes were measured. Fernandez et al. (2016) examined hydrotherapy to reduce pain and increase function while Avila et al. (2017) monitored pain reduction and increase in scapular motion.

Chronic Low Back Pain

While only one research study examined the efficacy of hydrotherapy as an intervention to decrease non-specific chronic low-back pain, the results showed important statistics to support

the use of hydrotherapy exercise. The research study did not make mention of any restrictions on analgesia or log on analgesia used by participants. It also did not make mention of the frequency and duration of hydrotherapy exercise for Group B.

Summary

Many forms of hydrotherapy were reviewed in relation to chronic pain relief in adults with knee-osteoarthritis, low-back pain, and fibromyalgia. All interventions within the research studies provided evidence to support hydrotherapy as an effective pain reduction technique.

Due to limitations in the characteristics of the participants studied, it is difficult to generalize these findings for all adults with chronic pain. There were no contraindications indicated within the studies, therefore there is evidence to support hydrotherapy as a safe non-pharmacological pain reduction technique as an alternative to opioids.

Limitations

This study was limited by the various procedures studied and inconsistencies within them. Three of the four studies reviewed only female participants while one reviewed only male. The inconsistency in gender population among the studies could potentiate differences in perception of pain.

A major discrepancy between studies was their mode of evaluating pain. Three of the four studies used a numeric pain rating scale from 0-10, but one used an alternate scale that measured pain from 0-100. This allowed for incongruities between the measurements of pain.

An additional limitation noted were the alterations in duration of exercise in hydrotherapy within the studies. Three of the studies made mention of designated warm-up and cool-down sessions within allotted exercise intervals. The inclusion or exclusion of this time period could also alter the results of pain reduction.

The studies reviewed all contained adults over the age of 18. While all participants were adults, the age range provides a large gap between participants. Patients of older could experience pain differently than those of younger age related to their co-morbidities.

Sample size was another limitation affecting this literature review of chronic pain. Two of the five studies used a population > 70 while the other three had populations smaller than 40.

Recommendations for Nursing

Future research should be conducted on hydrotherapy as non-pharmacological pain relief in patients with chronic pain. The only categories reviewed within this study were: knee-osteoarthritis and fibromyalgia. Chronic pain are occur among patients with a variety of conditions. Other diagnoses that include chronic pain should be examined for pain reduction using hydrotherapy. The most effective duration spent in water for hydrotherapy exercise should also be a variable further researched. One study demonstrated that walking was just as effective as swimming in reducing pain, therefore exercise with or without water should be examined as it relates to chronic pain reduction. Water temperature for pain reduction is an additional variable to be researched. Larger sample sizes with consistent population numbers should be examined as well.

Recommendations for Education

Nurses should be educated on the effectiveness of hydrotherapy as a technique for reducing chronic pain without the adjunctive opioid use. Nurses should be able to educate their patients and patient's families on the benefits, cost effectiveness, and easy to use nature of hydrotherapy as a pain reduction strategy. Nursing education on these subjects could be beneficial if incorporated into undergraduate Associate of Science in nursing and Bachelor of Science in nursing programs as well as graduate nursing programs.

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