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The Difference in Motivation and Self-Efficacy following Resistance Training and Individualized Diet Planning for Obese Patients with Chronic Pain

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Executive Summary

Problem. Obesity and chronic pain negatively impact patients' lives causing long-term physical, psychological, and economic consequences. Current management strategies focus on symptom management.

Purpose. In adults age 18-65 with a BMI ≥ 30, will a group program which included resistance training, counseling, and educational support on the key components of a Mediterranean like diet that is individualized for the patient increase motivation and self-efficacy to make these lifestyle changes designed to decrease BMI and chronic musculoskeletal pain?

Objective. Increase motivation and self-efficacy to continue individualized weight loss and physical activity programs following the study.

Plan. A pre- and post-intervention tests to compare changes in motivation and self-efficacy after a six-week program that included provider guided resistance training and individualized diet counseling changed.

Results. The results showed a statistically significant increase in dietary motivation (t= -2.714, p<.05), dietary self-efficacy (t= -4.360, p=.000), and exercise self-efficacy (t= -9.942, p=.000). Exercise motivation was not statistically changed (t= .248, p=.805).

Limitations. Limitations of the study included a small sample size (N=10) and limited control of extraneous variables such as age, gender, previous experience in diet and exercise.

Acknowledgements

I would like to offer my deep appreciation to my children Anna Grahek and Joseph Grahek for providing support and having patience with me during this journey. I would especially recognize Joseph Grahek for his assistance with the data collection portion of this project.

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Problem Recognition

Obesity

Obesity is a chronic condition that has significant impact on the patients and on healthcare (Hruby & Hu, 2015; Kyle, Dhurandhar & Allison, 2016; Kyrou, 2018). In the United States, 39.8% of the adult population is obese and this percentage continues to climb (Flegal et al., 2016; NCHC, 2017; Ogden et al., 2017). Obesity is highly correlated with comorbid conditions including heart disease, type 2 diabetes, hypertension, dyslipidemia, coronary heart disease, stroke, some cancers, osteoarthritis, mental illness, and many other chronic conditions including chronic pain (AHA, 2016; Bray, Kim, & Wilding, 2017; CDC, 2018b; Kyle, Dhurandhar, & Allison, 2016). Of the 93 million adults suffering from obesity in the U.S., the direct yearly cost burden is estimated at $147 billion (CDC, 2018b; Tremmel et al., 2017).

Chronic Pain

Chronic pain (CP) is a significant health problem. It affects 20% of the adult population in the United States (Dahlhamer et al., 2018), 30 to 50 percent of the adult population in the world (Souza et al., 2017; Vos et al., 2017), and is one of the top ten causes of disability worldwide (Fayaz et al. 2016; IHME, 2018; Souza et al., 2017). It has long-term physical, psychological, and economic consequences including increased risk of developing physical inactivity, cardiovascular disease, sleep disturbances, sexual dysfunction, and mental health disorders (Allen et al., 2016; Arranz, Rafecas, & Algre, 2013). CP also limits physical function, activities of daily living, quality of life, and socioeconomic environments (Allen et al., 2016; Arranz, Rafecas, & Algre, 2013; Cooper, Ells, Ryan, & Martin, 2018; Okifuji & Hare, 2015; Thomazeau et al., 2014). It is strongly associated with obesity. Although the exact mechanisms of chronic pain are unclear (Allen et al., 2016; Dieppe, 2013: Paley & Johnson, 2016), CP increases as BMI increases (Higgins et al., 2014), suggesting there is a comorbid relationship

between chronic pain and obesity (Allen et al., 2016; Arranz, Rafecas, & Alegre, 2014; Higgins et al., 2016; Okifuji, and Hare, 2015; Smuck et al., 2013; Thomazeau et al., 2014; Walsh et al., 2018). This comorbid relationship has been associated with $560 billion in direct healthcare costs in the United States (Dahlhamer et al., 2018). Locally, Pueblo, Colorado, has an obesity rate of 30.9%, which is increasing yearly.

Management

The mainstream management of chronic pain in obese patients has primarily involved treating the symptoms with analgesics rather than treating the cause of the pain, and thus it is not curative partly because the mechanism causing chronic pain is not well understood (Allen et al., 2016; Dieppe, 2013; Paley & Johnson, 2016). The literature reported an association between weight loss and improved pain control (Arranz, Rafecas, & Alegre, 2014; Okifuji, and Hare, 2015; Paley & Johnson, 2016; Thomazeau et al., 2014; Walsh, 2018; Van Hecke, Torrance, & Smith, 2013) as well as exercise and chronic pain reduction (Atalay et al., 2017; Magalhães et al., 2015; Ogston, Crowell, & Konowalchuk, 2016); thus, management strategies which include weight loss and exercise in obese patients with chronic pain-is likely the key (Paley & Johnson, 2016; Van Hecke, Torrance, & Smith, 2013). The primary barriers for this population to lose weight were adherence to weight loss and exercise programs, even when the educational program emphasized that improved quality of life could result from either or both (Arranz, Rafecas, & Alegre, 2014; Paley & Johnson, 2016; Van Hecke, Torrance, & Smith, 2013). Adherence is an important key to weight loss success. When dietary interventions were designed for the individual, commitment to the plan improved (Gibson & Sainsbury, 2017; Johnston et al., 2014). Carbohydrate-restrictive diets had greater short-term weight loss (Anton et al., 2017) and

long-term weight loss was seen in both carbohydrate-restrictive and low-fat diets, but adherence to the diet changes was paramount (Johnston et al., 2014).

The greatest weight loss was reported when counseling about the Mediterranean diet was included (Johnston et al., 2014; Kelaiditi et al., 2016: Sidahmed et al., 2014) and exercise was added to the weight loss plan (Cooper et al., 2018; Johnston et al., 2014). There is further evidence that a hypocaloric Mediterranean diet combined with an exercise program led to greater improvement in physical and functional fitness, as well as greater reduction in bodyweight (Landaeta-Diaz et al., 2013). For chronic low back pain in obese individuals, weight loss when combined with strength training showed greatest functional improvement (Paley & Johnson, 2016; Wasser et al., 2017; Vincent et al., 2014; Zdziarski et al., 2015; Ogston, Crowell, & Konowalchuk, 2016). Resistive exercise also resulted in increased adherence to plan of care, perceived function, and QOL (Wasser et al., 2017) but only if continued.

Motivation and Self Efficacy

The key to sustainability of diet and exercise management is increasing motivation and increasing self-efficacy, which reduces fear that exercise increase**s** pain (Wasser et al., 2017). Any plan for weight loss should include assessing and increasing motivation and self-efficacy for successful long-term weight loss, maintenance, management, and treatment of obesity (Anderson et al., 2016, Nurkkala et al., 2016; Warren, Smalley, & Barefoot, 2017). Counseling that emphasizes the connection between obesity and weight-related medical conditions should also be a standard of care to enhance intrinsic motivation for weight loss (Banerjee et al., 2018).

Purpose

The purpose of this study was to evaluate if a clinician-guided counseling group with a supported resistance training exercise program and an individualized Mediterranean-like diet

plan for obese patients, all of whom have concurrent chronic musculoskeletal pain integrated into their daily routines, will increase their motivation and self-efficacy to continue the treatment plan.

Project Question

In adults aged 18 to 65 years old with a BMI ≥ 30, will a group program which includes counseling, resistance training, and educational support on the key components of a Mediterranean-like diet that is individualized for the patient increase motivation and self-efficacy for making lifestyle changes designed to decrease BMI and chronic musculoskeletal pain?

PICO Statements

Population. Adults aged 18 to 65 years old with a BMI greater than 29.9 who reported chronic musculoskeletal pain, had a documented medical clearance for exercise and no diet restrictions that were inconsistent with a Mediterranean diet.

Intervention. An educational program was developed that included the importance of diet and exercise to lose weight and possibly decrease chronic pain, taught correct resistance exercise training, and demonstrated how to individualize a Mediterranean like diet. Application to practice was included with group resistance exercises three times a week.

Comparison. Pre-intervention and post-intervention measures of perceived motivation and self-efficacy and BMI and weight were measured and compared for differences.

Outcomes. The outcomes of the study were self-reported increase in dietary motivation, dietary self-efficacy and exercise self-efficacy to make and continue the lifestyle changes taught and practiced during the study intervention. The long-term goal to decrease BMI and improved pain control was beyond the scope of this study. However, statistically significant decrease in BMI, weight and pain was measured.

Project Significance, Scope, and Rationale

Chronic pain and obesity are worldwide comorbid conditions that threaten the quality of life, function, disease burden, and have a direct yearly health care cost burden of $560 billion in the United States alone. The management of this comorbid diagnosis is complex, unique, and requires a holistic, individualized management strategy that includes sustainability of treatment plans. There is a need in primary care for such strategies that are evidence-based and comprehensive that promote weight loss, increased physical activity, and motivation and self-efficacy to continue evidence-based lifestyle changes to facilitate a healthy weight and minimize comorbid conditions associated with a BMI over 29.9.

Theoretical Foundation

The self-care deficit theory (SCDT). Developed by Dorothea E. Orem (2006), the SCDT was the guiding framework for this project. The premise of the theory was that all humans desire to care for themselves given they are provided the necessary tools. This grand theory was clear and generalizable and was designed to guide and improve nursing practice (Orem, 2006). The theory made six assumptions. The first was that people should be self-reliant and responsible for their own and their family's care. The next two assumptions were that people are individuals and nursing is a form of action. The assumptions that were stated by Orem in 2006 and were the focus of this project included that a person's knowledge of health problems is necessary for promoting self-care behaviors, self-care is learned, and success in meeting self-care requisites are important components in prevention and treatment in primary care (Orem). Orem concluded, that nursing is needed when health related limitations inhibit the ability of a person to "provide for self the amount and quality of care required" (Orem, 2006, p. 142). The SCDT has been extensively used and shown effective in nursing research (Younas,

2017), specifically in the identification of self-care needs, education, and treatment (Devi et al., 2012; Sürücü & Kizilci, 2012; Villarruel & Denyes, 1997).

Teaching learning theory. The theory of behaviorism has been around over 100 years, first postulated by John Watson in 1913 (Clark, 2018). Behaviorism emphasizes that learning occurs when an individual respond to external stimuli. Two main types of conditioning include Pavlov's classical conditioning and Skinner's operant conditioning. Classical conditioning had four stages of conditioning: acquisition, extinction, generalization, and discrimination (Pritchard, 2014). Operant conditioning was a process of reinforcing a voluntary behavior by rewarding (Clark). This theory provided an educational framework for the project because the client's learning or change of behavior occurs from education (stimulus) and repetition in a safe environment. The stimuli education, a repetitive resistance training, becomes automatic over time (Clark, 2018). Ultimately, a change in behavior results. The key to positive change was the instructor by leading the learning environment in a positive manner to shape learners' behaviors (Pritchard, 2018). Sarah Kay (2016) wrote, "Practice does not make perfect. Practice makes permanent" (Kay, 2016).

Transtheoretical model of behavior change (TTM). TTM by Prochaska and DiClemente (1997) integrated psychotherapy and behavioral change theories into one unified construct. The authors (1997) stated the purpose of the model was to identify processes through which health behaviors change (Prochaska & Velicer, 1997). The major concept was change which occurs in stages. These core constructs are precontemplation, contemplation, preparation, action, and maintenance. The TTM provided a framework for the problem statement, since client was at least in the contemplation stage, they were ready to participate in the intervention. The theory provided guidance to understanding and assisting the patient motivation to transition from

preparation to action stage. It is known that obesity and chronic pain are bi-directionally linked but also have a behavioral component that are interrelated to biological, sociocultural, and psychological factors (Van Hecke et al., 2013). TTM core constructs have shown that assessing motivation provided positive results in adherence to weight loss, weight management programs, and education (Ceccarini et al., 2015; Pietrabissa et al., 2012; Ryan et al., 2011; Wilson & Schlam, 2004).

Bandura's self-efficacy theory. Albert Bandura (1986) is a social-cognitive psychologist well-known for his self-efficacy theory (SET). His theory has influenced research, education, and clinical practice. The fundamental premise was that if an individual feels their actions can influence the outcome and they want to achieve the outcome, they will continue to work toward the goal and figure out how to go around, over, or under any barrier they find in the way of achieving that goal. If they believe they cannot accomplish a goal, the first time they meet a barrier toward achievement, they have a tendency to stop working toward the goal, believing that "they knew they could not do it." Henry Ford's famous quote, "Whether you think you can, or you think you can't, you are right," summed up SET (Ford, 2019). Thus, self-efficacy is the patient's belief in their capacity to execute behavioral change (Bandura, 1982).

SET has been used in a number of weight loss research articles (Byrne, Barry, & Petry, 2012; Hays, Finch, Saha, Marrero, & Ackermann, 2014; Shin et al., 2011; Wilson et al., 2016). The evidence suggested that self-efficacy was particularly important as a predictor of initial success, and maintenance of weight loss (Elfhag & Rössner, 2005) and related behavior changes (Maes & Karoly, 2005), in obese patients (Clark, Cargill, Medeiros, & Pera, 1996; Trost, Kerr, Ward, & Pate, 2001). Significant positive effects of self-efficacy have been reported for weight

loss (Byrne et al., 2012; Hays et al., 2014; Palmeira et al., 2007; Shin et al., 2011; Warziski et al., 2008), physical activity (Linde et al., 2006; McAuley & Blissmer, 2000), and healthful eating.

Review of Literature

Scope of Evidence

A literature search was conducted using three electronic databases Cumulative Index to Nursing and Allied Health Literature Complete (CINAHL), MEDLINE, and PsycINFO through Regis University, Google Scholar, PubMed, and Cochrane Library. Search terms included "chronic pain in obesity," "chronic pain and obesity," "obesity and chronic pain management," "exercise and diet to manage obesity," "exercise and diet to manage chronic pain," "motivation and self-efficacy in management of obesity and/or chronic pain," "motivation and self-efficacy exercise and/or diet." The search yielded 7,123 results from CINAHL, PsycINFO and MEDLINE. To further refine the search, the search criteria were limited to 2011-2019 and adults aged 18 years or older, which yielded 331 articles. Using the same criteria, with the additional limit of scholarly (peer-reviewed) journals, and academic journals, the literature search was narrowed to 81 articles. The articles that did not include the comorbid relationship between obesity and chronic pain where eliminated. This yielded a final literature review of 49 articles which were then applied toward the development of this project (see Table 1).

Level of Evidence Supporting Project

Using the seven levels of evidence from Ackley et al. (2008), there were four level-one, six level-two, two level-three, five level-four, 12 level-five, 12 level-six, and eight level-seven articles that met the criteria for the project (Ackley et al., 2008).

Table 1

Levels of Evidence

Level of Evidence	Description	Articles
Level 1	Systematic review, RCT	4
Level 2	Well-designed RCT	6
Level 3	Well-designed without random	2
Level 4	Well-designed case or cohort	5
Level 5	Descriptive ROL, Qualitative	12
Level 6	Single Descriptive / Qualitative	12
Level 7	Opinion / Report	8

Reference 1: (Ackley et al., 2008)

Systematic Review of Literature

Chronic pain and obesity are chronic conditions that have significant impact on the patients and on healthcare (Allen et al., 2016; Arranz, Rafecas, & Algre, 2013; Cooper et al., 2018; Okifuji & Hare, 2015; Thomazeau et al., 2014). There is a strong correlation between obesity and chronic pain. These conditions are often concurrent and exist as a comorbid condition (Allen et al., 2016; Arranz, Rafecas, & Alegre, 2014; Higgins et al., 2016; Okifuji & Hare, 2015; Smuck et al., 2013; Thomazeau et al., 2014; Walsh, 2018). Management is most successful when treated with lifestyle modifications designed to increase physical activity and reduce weight (Paley and Johnson, 2016; Van Hecke, Torrance, & Smith, 2013).

Obesity

Obesity is defined as a body mass index (BMI) of 30 or higher (AHA, 2016; CDC, 2018b; NIH, 2013), and in the United States 39.8% of the adult population is obese and this percentage continues to climb (Flegal et al., 2016; NCHC, 2017; Ogden et al., 2017). In fact, if this trend continues at the current rate, by 2030, 85% of the adults in the United States and 58% of the world's adults will be overweight or obese (Hruby & Hu, 2015), putting these individuals at great risk for decreased quality of life, multiple comorbidities including early death, and costs

to the health care system in billions of dollars (Tremmel et al., 2017). Obesity is highly correlated with comorbid conditions including heart disease, type 2 diabetes, hypertension, dyslipidemia, coronary heart disease, stroke, some cancers, osteoarthritis, mental illness, and many other chronic conditions including chronic pain. (AHA, 2016; Bray, Kim, & Wilding, 2017; CDC, 2018b; Kyle, Dhurandhar, & Allison, 2016). Of the 93 million adults suffering from obesity in the U.S., the direct yearly cost burden is estimated $147 billion (CDC, 2018b; Tremmel et al., 2017).

Chronic Pain

Chronic pain can be described as ongoing or recurrent pain, lasting beyond the usual course of acute injury or more than three months (ACPA, 2018; Katz, Rosenbloom, & Fashler, 2015; Raffaeli, and Arnaudo, 2017; Treede et al., 2015). It affects an estimated 30 to 50 percent of the adult population in the world (Souza et al., 2017; Vos et al., 2017) and over 50 million or 20% of the adult population in the United States (Dahlhamer et al., 2018). CP has long-term physical, psychological, and economic consequences including increased risk of developing physical inactivity, obesity, cardiovascular disease, sleep disturbances, sexual dysfunction, and mental health disorders (Allen et al., 2016; Arranz, Rafecas, & Algre, 2013). CP also limits physical function, activities of daily living, quality of life, and socioeconomic environments (Allen et al., 2016; Arranz, Rafecas, & Algre, 2013; Cooper, Ells, Ryan, & Martin, 2018; Okifuji, and Hare, 2015; Thomazeau et al., 2014). For example, the number-one cause of disability worldwide is chronic low back pain (IHME, 2018). Chronic pain affects one in ten adults globally, it is in the top 20 causes of disability (Mansfield, Sim, Jordan, & Jordan, 2016), and all chronic pain is a major disability in both developed or developing countries (Fayaz et al. 2016: Souza et al., 2017).

Chronic pain (CP) is strongly associated with obesity, but the exact mechanisms of chronic pain are unclear (Allen et al., 2016; Dieppe, 2013: Paley & Johnson, 2016). CP increases as BMI increases (Higgins et al., 2014), suggesting there is a comorbid relationship between chronic pain and obesity (Allen et al., 2016; Arranz, Rafecas, & Alegre, 2014; Higgins et al., 2016; Okifuji, and Hare, 2015; Smuck et al., 2013; Thomazeau et al., 2014; Walsh, 2018). This comorbid relationship has been associated with $560 billion in direct healthcare costs in the United States (Dahlhamer et al., 2018), due in part to the increased office visits, higher complexity, and poor prognosis. Locally, Pueblo, Colorado, has an obesity rate of 30.9%, which is increasing yearly and is already above average for comorbid obesity and chronic pain (Pueblo City-County Health Department [PCCHD], 2016).

Management

The mainstream management of chronic pain in obese patients has primarily been treating the symptoms with analgesics, not treating the cause of the pain. Thus, it has not been curative, partly because the mechanism causing chronic pain is not well understood (Allen et al., 2016; Dieppe, 2013; Paley & Johnson, 2016). However, because of the strong correlation between chronic pain and obesity, the focus for actual treatment has been on dieting. Unfortunately, focusing on individual diagnosis (obesity) does not facilitate changes in lifestyle beyond dieting. Comprehensive management has been shown to improve function and reduce the risks or impact of comorbid conditions including chronic pain (Rothberg et al., 2013; Van Hecke, Torrance, & Smith, 2013). Although the literature indicates physical activity and weight loss are effective strategies for management of this comorbid condition, there are no established guidelines or standards of care (Paley and Johnson, 2016). The literature reported that there is an association between weight loss and improved pain control (Arranz, Rafecas, & Alegre, 2014;

Okifuji, & Hare, 2015; Paley & Johnson, 2016; Thomazeau et al., 2014; Walsh, 2018; Van Hecke, Torrance, & Smith, 2013) and exercise and chronic pain reduction (Atalay et al., 2017; Magalhães et al., 2015; Ogston, Crowell, & Konowalchuk, 2016); thus, management strategies which include weight loss and exercise in obese-chronic patients are likely the key (Paley & Johnson, 2016; Van Hecke, Torrance, & Smith, 2013). Education, along with specific advice about exercise, weight loss, and functional activities that were tailored to the individual, were found effective for decreasing chronic pain (Van Hecke, Torrance, & Smith, 2013); however, it was also found that one of the primary barriers for this population to lose weight was difficulty in adherence to weight loss and exercise programs, even when the educational program emphasized improved quality of life (Arranz, Rafecas, & Alegre, 2014; Paley & Johnson, 2016; Van Hecke, Torrance, & Smith, 2013). Adherence is an important key to weight loss success. It was found that when dietary interventions were designed for the individual, commitment to the plan improved (Gibson, & Sainsbury, 2017; Johnston et al., 2014). Furthermore, government-based dietary guidelines designed to be adapted to different dietary, cultural, and cost preferences were found to be useful tools for individualizing a dietary intervention. When added to encouraging individuals to self-monitor their food intake, Gibson and Sainsbury (2017) also found success for people to maintain dietary changes and achieve weight loss (Gibson & Sainsbury, 2017). Carbohydrate restrictive diets had greater short-term weight loss (Anton et al., 2017) and long-term weight loss was seen in both carbohydrate restrictive and low-fat diets; thus, adherence to diet changes is paramount (Johnston et al., 2014). However, the greater weight loss was reported when counseling about the Mediterranean diet was included (Johnston et al. 2014; Kelaiditi et al., 2016: Sidahmed et al., 2014) and exercise was added to the weight loss plan (Cooper et al, 2018; Johnston et al., 2014). There is further evidence that a hypocaloric

Mediterranean diet combined with an exercise program led to greater improvement in improved physical and functional fitness, as well as greater reduction in bodyweight (Landaeta-Diaz et al., 2013). For chronic low back pain in obese individuals, weight loss when combined with strength training showed the greatest functional improvement (Wasser et al., 2017; Wasser & Vincent, 2015; Vincent et al., 2014; Zdziarski, Ogston, Crowell, & Konowalchuk, 2016) and was shown to reduce pain and disability as well as improved quality of life, increased physical activity, physical capacity, and decreased fear of movement (Magalhaes et al., 2015). Resistive exercise also resulted in increased adherence to plan of care, perceived function, and QOL (Wasser et al., 2017) but only if continued.

Motivation and Self Efficacy

The key to sustainability of diet and exercise management is increasing motivation and increasing self-efficacy, which reduces fear that exercise increases pain (Wasser et al., 2017). Any plan for weight loss should include assessing and increasing motivation and self-efficacy for successful long-term weight loss, maintenance, management, and treatment of obesity (Anderson et al., 2016, Nurkkala et al., 2016; Warren, Smalley, & Barefoot, 2017). Counseling that emphasizes the connection between obesity and weight-related medical conditions should also be a standard of care to enhance intrinsic motivation for weight loss (Banerjee et al., 2018).

The clinical problem focuses on motivation and self-efficacy of patients with both chronic pain and morbid obesity as a comorbid diagnosis to make lifestyle modifications. Motivation is defined as the “desire or willingness to do something” (Oxford English Dictionary, 2019, Definition 1.1). Self-efficacy is the belief that one’s own ability can influence and control the way in which events are experienced or completed (Akhtar, 2008). Although motivation and self-efficacy are interrelated, they are two separate concepts. Self-efficacy is the belief in one’s

own capacity to achieve, while motivation is the individual's desire to achieve the given goals. The project's focus is to change motivation and self-efficacy of the individual through clinician-guided group resistance training and educational support as well as a structured diet, while the goal is to reduce weight and chronic pain levels. Therefore, the primary outcome measures are a positive change in both motivation and self-efficacy of the individual to make lifestyle changes. The secondary outcomes are a decrease in the individual's BMI and chronic pain level.

Strengths, Weaknesses, Opportunities and Threats (SWOT)

Strengths

The project strengths were access to an at-risk population and higher-than-average Medicaid usage, which provided for an ample population pool. The Mediterranean-like diet was similar to the average diet of the population, the foods were cost-effective, and modification was easy. This diet involved simple changes to portion, preparation, with a focus on protein and quality fats. The resistance band exercises were easily understood, cost effective, and could be done at home. This alleviated the cost burden to the population.

Weakness

Weaknesses were related to physical function and compliance of the population. Adherence to physical actively and diet program was the primary weakness. The patients' physical function was weakness because pain acted a barrier to change in lifestyle habits of inactivity and poor diet. The patient availability impacted their willingness to participate in diet modification and physical activity.

Opportunity

Pueblo County had a significant population that was at-risk and was considered underserved (U.S. Census Bureau, 2017, a). This provided an ample patient base, since obesity

has a relationship with chronic pain (Allen et al., 2016; Arranz, Rafecas, & Alegre, 2014; Higgins et al., 2016; Okifuji & Hare, 2015; Smuck et al., 2013; Thomazeau et al., 2014; Walsh, 2018). Availability was considered an opportunity since the primary researcher had access to experts in the field, facilities, and validated study tools at no cost. The primary researcher's clinic predominantly serves this population.

Threats

The primary threat to this study was lack of motivation and self-efficacy to participate. Transportation to the training facility and fixed group activity times were considered threats to the project. Socioeconomic factors such as changing cooking style, portion, and food preparation were internal threats. External threats included family demands such as childcare and related responsibilities.

Driving Forces

The primary driving force of the study was that chronic pain and obesity are enormous problems both for the patient and the global population. There was a need for tested, comprehensive management strategies for this population. The available to the exercise facility and clinic service were free of charge. In addition, all material for the subject was at no expense to the participants. The expert assistance in providing education and teaching had been donated at no charge to the patient. The validated and reliable evaluation tools were free of cost.

Restraining Forces

Adherence was the primary restraining force as the final sample size was ten (N=10). The missing data was not studied to evaluate if adherence was directly impacted by lack of motivation and self-efficacy. Disbelief or nonacceptance of the benefits of physical exercise and/or diet was also not studied for impact on participation in the study, nor was the level of pain

acting as a restraining force. The limited available times for training and counseling did limit the number of participants.

Needs, Resources, and Sustainability

Needs

The needs for the study included educational material, resistance bands, training staff, and exercise facility. Educational materials included estimated caloric daily requirement, the healthy Mediterranean-style pattern, and a daily nutritional goals handout based on the 2015-2020 dietary guidelines for Americans (ODPHP, 2015) (see Appendix). Further, each participant was provided a sample food log, and common food nutritional fact list (see Appendix B and Appendix C). The participants were provided a TheraBand's of varying resistance and a resistance exercise workouts handout with illustrations. The exercise and dietary counseling were provided after each group workout. The personnel committed two to four hours a week for six weeks.

Resources

The primary resources needed for this study included access to space for the group participation and an agreement to participate by a trained staff. The testing facility was Fit-Fast-Strong CrossFit gym located at 91 Silicon Dr, Pueblo West, CO, 81007. Letters of letters of agreement of the participating facilities was obtained (see Appendix G).

Sustainability

The educational material, including the dietary guidance and exercise material, was provided to the participants. The TheraBand's and educational material were provided to the subjects to keep at completion of the study and when a subject no longer participated. The educational material was available to any individual regardless of participation in the project.

The group exercise and counseling session did not continue at the conclusion of the study. However, the participants were encouraged to continue the program to reach personal goals of healthy lifestyle modification. The primary researcher was available for questions, concerns, and counseling for at least four months following conclusion of the study.

Cost and Benefits

Costs

The projected costs for the study were materials $483.82, and the facilities and staff costs were donated (see Table 2). The actual cost was $349.33 for material because the copying cost were covered by Adult Medicine Specialist clinic. The cost to the subjects was very limited also as projected (see Table 3). The projected cost to the subject if they want to pay for a program similar to the study for six weeks was estimated at $1,285.13 and the actual cost was $0.00 (see Table 3). The cost of resistance band varies depending of amount of resistance. The mean cost per band was used to estimated costs to the patient (see Table).

Table 2

Costs for Project

Costs			
Material Cost			
	Quantity	**Actual Cost**	**Projected Cost**
TheraBands			
Yellow	6 yds	$6.98	$6.98
Red	25 yds	$42.15	$42.15
Green	50 yds	$77.56	$77.56
Blue	6 yds	$11.15	$11.15
Black	6 yds	$86.00	$21.50
Silver	25 yds	$61.50	$61.50
Gold	6 yds	$27.00	$27.00
Paper	8 reams	$36.99	$36.99

Patient handouts (57pg/pt)	Copying 0.09/pg x 1881 pgs	$0.00	$169.29
Project Tools 10pg/pt	Copying 0.09/ pg x 330 pg	$0.00	$29.70
Subtotal		$349.33	$483.82
Staff Cost			
	Quantity	**Actual Cost**	**Projected Cost**
Researcher $50/hr	1 for 12 hrs	$0.00	$600.00
Physical Trainer $26/hr	1 for 12 hrs	$0.00	$312.00
Support Staff $16/hr	2 for 12 hrs	$0.00	$384.00
Facilities and Staff Cost			
Clinic	1 for 2.5 hrs	$0.00	$1,650.00
Gym	1 for 12 hrs	$0.00	$3,960.00
Materials		$349.33	$483.82
Staff Cost			$1,296.00
Total		$349.33	$7,389.82

Table 3

Costs to Participants

Estimated Cost to Patient			
Materials	**Quantity**	**Cost**	**Actual Cost**
Bands $3.60 each	2	$7.20	$0.00
Handouts	1	$5.13	$0.00
Facility	1	$396.00	$0.00
Staff	2	$129.60	$0.00
Total		$537.93	$0.00
Costs per Band $1.78-$6.75			
Average Cost per Band $4.00			

Benefit

It was nearly impossible to apply a dollar amount to the benefit of losing weight and decreasing chronic pain. These comorbid conditions have been associated with increasing risk for type two diabetes, hypertension, dyslipidemia, coronary heart disease, and stroke, just to

name a few (AHA, 2016; Bray, Kim, & Wilding, 2017; CDC, 2018b; Kyle, Dhurandhar, & Allison, 2016), Both obesity and chronic pain impact physical function, activities of daily living, and quality of life (Allen et al., 2016; Arranz, Rafecas, & Algre, 2013; Cooper, Ells, Ryan, & Martin, 2018; Okifuji & Hare, 2015; Thomazeau et al., 2014). Beyond the profound physiological and physical burden of these conditions is the massive cost burden. In the United States, an estimated $707 billion is associated with these comorbid conditions (CDC, 2018b; Dahlhamer et al., 2018; Tremmel et al., 2017), which impact 59.8% of the U.S. population combined (CDC, 2018b; Dahlhamer et al., 2018).

Project Objectives

Mission

The mission of this project was to improve adherence to lifestyle modification through increasing motivation and self-efficacy using holistic, evidence-based treatment guidance for adult obese patients with chronic pain in primary care utilizing resistance training and diet modification.

Vision

The vision of this project for the population was to decrease obesity and chronic pain through diet and exercise.

Project Goals and Objective.

The goal of the project was to improve motivation and self-efficacy to continue a treatment plan of diet and exercise which is designed to improve BMI and CP management. Although beyond the scope of this project, a long-term goal remains to be to decrease the level of chronic pain, see five to ten percent body mass loss, and decrease the co-morbidities associated with obesity. An additional long-term goal is to provided evidence for the recommended

interventions for successful treatment plans for the management of obese adult patients with chronic pain. The project, as a pilot quality improvement study was a first step toward meeting that goal.

The objective of the project was to increase motivation and self-efficacy in adult obese clients with chronic pain to continue a diet modification and planned exercise resistance training program. Dietary motivation and self-efficacy were measured using the *Stages and Processes of Change* questionnaire in weight management (S-weight and P-Weight) (Andres et al., 2011), and the *Diet Self-Efficacy* Scale (DIET-SE) (Stich, Knäuper, & Tint, 2009). Exercise motivation and self-efficacy was measured by the *Exercise Motivation Inventory-2* (EMI-2) (Markland & Hardy, 1993), and *Exercise Self-Efficacy Questionnaire* (EXSE) (McAuley et al., 1993).

Methodology

Research Design

This quality improvement project was a pre- and post-test quantitative descriptive study designed to see if motivation and self-efficacy to maintain an exercise and weight-loss diet was increased following the intervention. This study does not generalize beyond the study population.

Participants

The project team was comprised of the primary investigator (PI), a personal trainer, voluntary medical staff, capstone advisor, clinical mentor, and subjects.

Primary investigator. The PI was a board-certified acute care nurse practitioner and board-certified family nurse practitioner. He has a Master of Science in Nursing and a Bachelor of Science in Nursing, Chemistry, and Biology with over 13 years of primary care experience

focusing on the management of complex chronic comorbid conditions such as obesity and chronic pain.

Personal trainer. The personal trainer was certified CrossFit trainer, level one and level two, and a certified aerobic capacity coach with over 11 years' experience.

Voluntary medical staff (VMS). The VMS included one medical assistant and an 18-year-old adult with fitness experience to aid with set-up and monitoring participant safety.

Subjects. The inclusion criteria for participants was age 18-65 years old that had a measured BMI greater than 29.9, chronic musculoskeletal pain that was persistent or recurrent pain lasting greater than three months, were current clients at adult medicine specialist (AMS) a primary care clinic in Pueblo Colorado, and had been medically cleared by their care providers to participate in the diet and exercise programs. Participation in the study was offered to all patients who met the inclusion criteria and signed an informed consent.

Sampling. The AMS clinic saw an average of 1,100 adult patients per month, and based on epidemiological data in 2017, 30.9% of the Pueblo city adult population was obese (U.S. Census Bureau, 2017). This provided a total population pool of 340 patients who met the inclusion criteria of a BMI greater than 29.9. Based on a power analysis with 95% confidence level, with a 10% margin of error, the target population size needed to avoid type I or type II errors was 76 (Raosoft sample size calculator, 2004). To achieve a power analysis of 0.99, a convenience sample of 112 patients would be needed. Thirty-seven subjects were needed to achieve a power analysis co-efficient of 0.80. The sample size of 10, did not reach power.

Definition of Variables

Body mass index. BMI was calculated by dividing weight in pounds by height in inches squared and multiplying by a conversion factor of 703 (CDC, 2018a).

Chronic pain. Chronic musculoskeletal pain was defined as persistent or recurrent pain that arose from a disease process directly affecting bones, joints, muscles, and/or soft tissue and lasted greater than three months (Treede et al., 2015). It was limited to nociceptive pain that did not arise as a result of neuropathy or somatic-referred pain. Pain was measured with the *Visual Analogue Scale* which used a 11-point pain numeric rating scale with a reliability of 0.97 (Alghadir, Anwer, Iqbal, & Iqbal, 2018).

Diet. The Mediterranean-style diet was based on the 2015 U.S. dietary guidelines (HHS, 2015).

Individualized educational support. Individualized educational support was provided two times a week after the group workouts. At the first session, participants, based on age and gender, were provided with the recommended daily caloric intake and the Healthy Mediterranean-Style Eating Pattern including amounts of food from each food group, vegetables, fruits, grains, diary, protein, and oils (see Appendix B). Each subject was also given a guide that included serving size, calories, protein, fats, and carbohydrates of some of the common foods (see Appendix B). The subjects were also provided with a sample daily meal log (see Appendix C).

Counseling. Participants were provided with 15-minute group counseling and guidance with the education sessions two times a week for the duration the study. See Appendix B, Figure Two and Figure Three for the guidelines and caloric intake teaching aids.

Resistance training. The subjects were initially given a 54-inch yellow TheraBand that provided 3.0 *lbs*. of resistance and a detailed exercise routine (see Appendix D and Appendix E). The resistance training was comprised of upper body, core body, and lower body resistance band exercises (see Appendix E). The subjects performed resistance workout for 45 minutes three

times a week; two in a group setting supervised by the PI and the third at-home (see Appendix E). The 45 minutes included a 10-minute warm-up and cool-down period.

Motivation. Motivation was defined as the "desire or willingness to do something" (Oxford English Dictionary, 2019, Definition 1.1).

Self-efficacy. Self-efficacy was defined as the belief that one's own ability can influence and control the way in which events are experienced or completed (Akhtar, 2008).

Extraneous variables. The most common extraneous variables for this study were situational and participant. The situational variables were controlled by standardization, consistent facility, and consistent protocols. Participants' extraneous variables were gender, and age. The time frame and convenience sampling were limitations of the study since these variables could not be controlled; however, the cohort pool was drawn from primarily Medicaid and Medicare recipients who are part of an at-risk, underserved population. This population was consistent with the city's ethnic diversity although not specifically measured.

Instruments

The primary dependent variables were divided into four individual variables: motivation to maintain diet modifications to decrease BMI, motivation to maintain adherence to physical activity programs to decrease chronic pain, self-efficacy to maintain diet modifications to decrease BMI, and self-efficacy to maintain adherence to physical activity programs to decrease chronic pain.

Dietary Motivation. The *Stages and Processes of Change* questionnaire in weight management (S-weight and P-Weight) was a 35-item questionnaire based on the transtheoretical model of change utilized to evaluate dietary motivation (see Appendix F). This tool had two components: the stage of change (S-weight) and the process of change (P-weight). The S-weight

directly correlated to a change in the TTM's stage and the P-weight is the process of change from one stage to the next. This instrument was designed and validated by Andres et al. (2009; 2011; 2015). At least one of the studies showed a content validity of 91.3% based on consensus of experts and a reliability of 0.92 utilizing Cronbach's alpha (Andres et al., 2009; 2011; 2015). The author of this tool has given explicit permission for this tool to be utilized in research (Saldana, 2013).

Dietary self-efficacy. The *diet self-efficacy* tool (DIET-SE) was a scenario-based measure consisting of 11-quest ions, and it is used to identify dieting self-efficacy (Knauer & Tint, 2009). (see Appendix F). This tool demonstrated validity and reliability in multiple studies, with at least one having a construct validity of 91.0% and reliability of 0.95 (Martinez et al., 2019; Golebiowska & Kwiecien, 2018; Stich, Knäuper, & Tint, 2009). This tool was provided by the Measurement Instrument Database for the Social Sciences (MIDSS), and MIDSS gives permission for this tool to be utilized in research (Measurement Instrument Database for the Social Sciences, n.d.).

Exercise motivation. The *Exercise Motivation Inventory-2* (EMI-2) was a 52-question exercise motivation tool designed to identify the motivational status of the patient to exercise (Markland & Hardy, 1993). (see Appendix F). This measure was provided and initially validated by Dr. David Markland of Bangor University (Markland & Hardy, 1993). The tool was also found to have acceptable construct validity which included both convergent validity, and discriminant validity. The tool was found to a internal consistency (.91) and retest reliability of (.88) (Klain et al., 2015; Zeek et al., 2015). Permission to use this measurement tool was given by Dr. David Markland to all individuals for the purpose of research (Exercise Motivation Measurement website, 2014).

Exercise self-efficacy. The *Exercise Self-Efficacy Questionnaire* (EXSE) was an eight-question assessment tool to determine the patient's self-efficacy towards exercise (McAuley et al., 1993) (see Appendix F). This tool was found to be valid and reliable in multiple studies, with at least one study showing an acceptable construct validity and a reliability of 0.92 by Cronbach's alpha (McAuley et al., 1993; Yamada et al., 2011). Permission to utilize this measure was provided by the Exercise Psychology Lab at the University of Illinois (University of Illinois, n.d.).

The secondary dependent variables were BMI, chronic pain, and weight. Weight was measured in pounds by a clinic grade digital scale. Pain was measured using the *Visual Analogue Scale* (see Appendix F).

Risk Evaluation

The risks associated with the study were related to the intervention. Resistance training was low-impact and is guided by medical personnel. This exercise was considered minimal risk because it placed the subjects at no greater probability of harm or discomfort than that which would ordinarily be encountered in their daily lives (Protection of Human Subjects, 2018). The patients had medical clearance as part of the selection process. The individualized nutritional education was based on a Mediterranean-like diet which is considered an exempt intervention, because this is educational guidance was based on federal initiatives (Protection of Human Subjects, 2018). Within the study, the PI had modified the resistance exercises such that the subjects could perform them at home with minimal financial expenditure post-study. Furthermore, there was no cost burden or compensation for participation in the study. The Mediterranean-like diet was chosen with respect to the social economic status of the population. The basis of the Mediterranean diet was consistent with simple and common food products seen

in the population diets of this region. Therefore, adherence to the diet was a matter of adjusting portions and ingredients rather than purchasing unusual or expensive food products.

Protection of Human Subjects

The project potentially met one criterion which might have required IRB approval. According to the Code of Federal Regulations 13, part 124, section 103.124, an economically disadvantaged person is someone who is socially disadvantaged because of decreased capital and credit compared to others (13 CFR § 124.103). Since, the majority of the subjects in the study had Medicaid or Medicare, this population was considered socioeconomically disadvantaged, which would make it a vulnerable population under the criteria of the National Bioethics Advisory Commission. They defined a vulnerable subject as having limited capacity to make an informed consent. However, this population did not have decisional impairment but rather situational vulnerability and because this was a quality improvement project (QI) and the intervention was minimal risk placing no greater probability of harm or discomfort than that which would ordinarily be encountered in their daily lives the study was considered exempt (Protection of Human Subjects, 2018). The individualized nutritional education based on a Mediterranean-like diet was considered an exempt intervention, since the educational guidance is based on federal initiatives (Protection of Human Subjects, 2018). Further, the exercises and diet guidance are consistent with the standards of care for this population. Finally, the individual's components have been previously recommended individually, the QI study combines these practices with practitioner guidance to improve both efficacy and motivation to continue healthy lifestyle changes. For the above reasons the Regis University Human Subjects IRB had determined that this project did not meet the definition of human subject research under the purview of the IRB according to federal regulations (see Appendix H).

During the data collection phase of the project, limited protected data was obtained which contained the first names of the participants. To maintain confidentiality, a master list of first names were used as an identifier. This list, data dictionary, and content-specific database were stored in a locked cabinet in a secure, locked room within the clinic which has limited user access. From the master list, a de-identified list was generated by assigning each participant an alphanumeric code. This de-identified list, which contains the database required for statistical analysis for the QI project, to help ensure anonymity, will be stored as above for five years (until 2025) and then destroyed by shredding all documents.

Data Analysis and Results

Data Analysis

Statistical analysis was completed using the IBM SPSS Statistics package 26 provided by Regis University. Only complete data sets were analyzed. The missing data was handled by listwise deletion and not considered in the statistical analysis. The data collected included subjects age (ordinal level data), and gender (nominal level data) pre-intervention. BMI, pain level, weight and instrument scores (S-weight and P-Weight, DIET-SE, EMI-2, and EXSE) were collected pre- and post-intervention and analyzed as ratio-interval level.

Instrument validity and reliability. The *Cronbach's alpha* for dietary motivation was excellent (α= 0.946) [Field, 2018}, dietary self-efficacy was poor (α= 0.508), exercise motivation was excellent (α= 0.911), and exercise self-efficacy was poor (α= 0.033). See Appendix I; Table 4 for additional details. This was contrary to the literature findings. The most likely explanations for the poor alpha was the small sample size (N=10) and short duration time (six months) of study (see Appendix I).

Pearson correlation coefficients were applied to the measures for test-retest reliability and validity estimation to express the magnitude of relationships between variables (Polit, 2010). Dietary motivation yielded the following: *Stages of weight* (r= 0.900, p= 0.489) and *process of weight* (r= .248, p<.001). Exercise motivation (EMI-2) resulted in a Pearson correlation of (r= .836, p<.001). Self-efficacy for diet (r=.341, p= .066) and exercise (r= .024, p= .835) were weakly correlated. However, all the paired variables showed positive linear relationships which supported reliability of the tools (see Appendix I; Table 8). Again, sample size and number of questions per instrument impact the correlation coefficient.

Results

Descriptive statistics. The age of the participants (N= 10) ranged from 29 to 65 years old with a mean age of 45.5 years. The study population consisted of three men (30%) and seven women (70%). The disproportionate ratio of women to men in the project may have been related to gender issues. Most of the men expressed a pre-conceived understanding of the resistance exercises and appeared more resistant to educational guidance.

Motivation to Continue Diet Intervention. The S-weight and P-weight directly correlated to the Transtheoretical model of behavior change. S-weight resulted in a small mean (M= -0.60, 95% *CI* [-1.100, -0.010]) variation with statistical significance (t= -2.714, p< 0.05). This indicated a transition from preparation to the action stage. Further, the P-weight's large negative mean (M= -3.40, 95% *CI* [-5.304, -1.497]) and strong statistical significance (t= -3.613, p< 0.001) supported the process of transition to the next stage of change. Therefore, the pre-and post-intervention test scores for diet motivation were statistically significant for increased motivation to continue the diet plan post study (see Appendix I; Table 11).

Self-Efficacy to Continue Diet Intervention. Dietary self-efficacy yielded a large negative mean (*M*= -3.43, 95% CI [-5.04, -1.82]) which is to be expected as self-efficacy increases and a small *SE* (0.7874) which implies greater representation of the population. The pre-and post-intervention test scores for diet self-efficacy were statistically significant (*t*= -4.360, *p*= 0.000) indicating an increase in self-efficacy to continue diet post intervention (see Appendix I; Table 11).

Motivation to Continue Exercise Intervention. The EMI-2 provided a small positive mean (M= 0.38, 95% CI [-2.68, 3.43]) and large standard deviation (SD=9.56). This indicated very little variation in change from pre- and post-intervention in exercise motivation. Thus, no statistical (*t*= .248, p=.805) support that guided group resistance exercise improve motivation to maintain physical activity (see Appendix I; Table 11).

Self-Efficacy to Continue Exercise Intervention. Self-efficacy (EXSE) to maintain adherence to physical activity resulted in a negative mean (*M*= -1.70, 95% CI [-2.04, -1.36]) and very small *SE* (0.1710). The negative mean indicated that study population changed from baseline and small *SE* provided better representation of the population. Self-efficacy of the population was significantly (*t*= -9.942, *p*= 0.000) increased to continue physical activity post intervention.

BMI, Weight and Pain. The mean change in BMI (*M*= .87 *lbs/in.*^{2}) and weight (*M* = 5.1 *lbs*) over six weeks were not clinically significant. However, the change was statistically significant for both BMI (*t*= 3.2573, *p*< 0.010) and weight (*t*= 3.3800, *p*= 0.008) for this population. There was strong correlation with the intervention and change in BMI (*r*= 0.993) and weight (*r*= 0.994) for this population. The daily pain levels showed a mean (*M*= 1.4) decrease which was statistically (*t*= 8.5732, *p*< 0.001) significant (see Appendix I; Table 12).

Discussion

This study investigated if motivation for making lifestyle changes designed to decrease BMI in adults with obesity and chronic pain could be improved by a group program which included guided group counseling, resistance training and individualized components of the Mediterranean diet. In respects to TTM model, the stages of change within each stage must move from entering that stage to transition to the next. The six-week program improved dietary motivation by significantly increasing both the process ($p = 0.001$) and the transition ($p < 0.05$) from preparation to action stages of change. The intervention improved the subject's ability to transition through preparation stage and improved the transition from preparation to action stage. These findings were consistent with the literature which showed that encouragement and individualized dietary interventions improved motivation to maintain healthy dietary programs (Gibson, & Sainsbury, 2017; Johnston et al., 2014).

Dietary self-efficacy to continue the lifestyle changes to decrease BMI and chronic pain in this population was improved. The combined group counseling, individualized dietary guidance, and exercise program statistically improved ($p = 0.000$) the subject's belief that they could continue the program. This was also consistent with the literature findings that adherence is key and that individualization increases positive outcomes (Gibson, & Sainsbury, 2017; Johnston et al., 2014). Further, the literature identified that individualized counseling with regards to the Mediterranean diet showed a greater reduction in bodyweight (Landaeta-Diaz et al., 2013). This was seen within in the study which yielded statistically significant BMI ($p < 0.010$) decrease and weight loss ($p = 0.008$) despite a very low population (N=10) and short duration of time for the study.

Motivation to continue exercise post-intervention was not increased (p= 0.805) by guided group counseling, resistance training and individualized diet counseling. This finding was contradictory to the literature that resistant exercise in combination with individualized dietary interventions improved adherence (Cooper et al., 2018; Johnston et al., 2014). However, the lack of motivation was consistent with studies that recognized adherence to weight loss and exercise as primary barriers to success (Arranz, Rafecas, & Alegre, 2014; Paley & Johnson, 2016; Van Hecke, Torrance, & Smith, 2013). These findings may have been influenced by sample size (N= 10), Since, the t-ratio and means for exercise motivation were statistically insignificant (M= .375, t= .248). The study did not look at differences in gender, weight, or other co-morbid conditions which may also have impacted the findings as well as the limited time (6 weeks) for the study. Regardless, the study found that motivation for weight loss and motivation for physical activity were not simultaneously increased through the six-week program. Further, exploratory research my shed light into the influence impacting motivation.

Exercise self-efficacy was increased from concurrent individualized diet and group resistance training. This increase was found to be statistically significant (t= -9.942, p= 0.000) which was also supported by the negative mean (M= -1.70) and very small standard of error (SE= 0.17). The increase seen in self-efficacy through the intervention was consistent with the literature (Cooper et al, 2018; Johnston et al., 2014). Interestingly, looking at both dietary and exercise self-efficacy the data yielded a much larger t-value for exercise self-efficacy. This suggested that the intervention improved exercise self-efficacy to a greater extent than that of dietary. Again, gender, weight, comorbid conditions, and or time may impact these findings.

BMI, weight, and pain levels were statistically analyzed even though they were not the primary purpose of the study. The intervention yielded statistically significant decreases in BMI,

weight, and pain. The average weight loss was 5.1 *lbs* (BMI *M*= .87 *lbs/in.*^{2}) which would not be clinically significant. Although, the population sample was small (N= 10) the weight loss was statistically significant (p= 0.008) for this population. This suggested that the clinical recommendation of approximate 2 *lbs* per week of weight loss maybe be unrealistic for this population. The average decrease in daily pain levels was 1.4 points, was clinical and statistically significant (p< 0.001) change in daily chronic pain levels in this population. The populations daily pain level decreased from moderate to mild daily pain. Thus, the project supported the literature findings that combined weight loss and exercise was an effective management strategy for this population (Paley & Johnson, 2016; Van Heck, Torrance, & Smith, 2013).

Conclusion

Although the small sample size (N=10), severely limited any conclusions for this study, it demonstrated that for this population, the intervention was statistically and clinically successful for increasing dietary motivation, dietary self-efficacy, and exercise self-efficacy to continue both the diet and exercise. Exercise motivation was not impacted by the intervention. This study supported other findings in the literature that management strategies that included education, individualized Mediterranean diet, and resistance exercise were effective for decreasing bodyweight and chronic pain in obese adults (Landaeta-Diaz et al., 2013; Magalhaes et al., 2015; Wasser et al., 2017; Wasser & Vincent, 2015; Vincent et al., 2014; Zdziarski, Ogston, Crowell, & Konowalchuk, 2016) and this project confirmed the reciprocal relationship between BMI and chronic pain that was reported in the literature (Higgins et al., 2016). It did not control for gender differences or if either the motivation or SE for diet and or exercise would continue when the group exercise and counseling were no longer available.

Limitations

The major limitations of the study included the very small sample size (N=10), limited time duration for the study (six weeks) and limited control of extraneous variables such as differences in age, gender, previous experience (diet and exercise), season (fall November to December), and situational variables (socioeconomic, response to counseling). Further, the time needed to complete the pre and post intervention tools could have limited the studies statistical data.

Recommendation

It is recommended that further research be done with larger sample sizes, over a longer time frame, and control for extraneous variables. Further investigations on individual subject characteristics that could skew the data. If the study is to be repeat decreasing the number of questions in the tool my decrease the time burned for evaluation place on the subject. It is also recommended that long-term studies include differentiating dietary motivation, dietary self-efficacy, exercise motivation, and exercise self-efficacy to predict influence of each variable on weight loss and on chronic pain.

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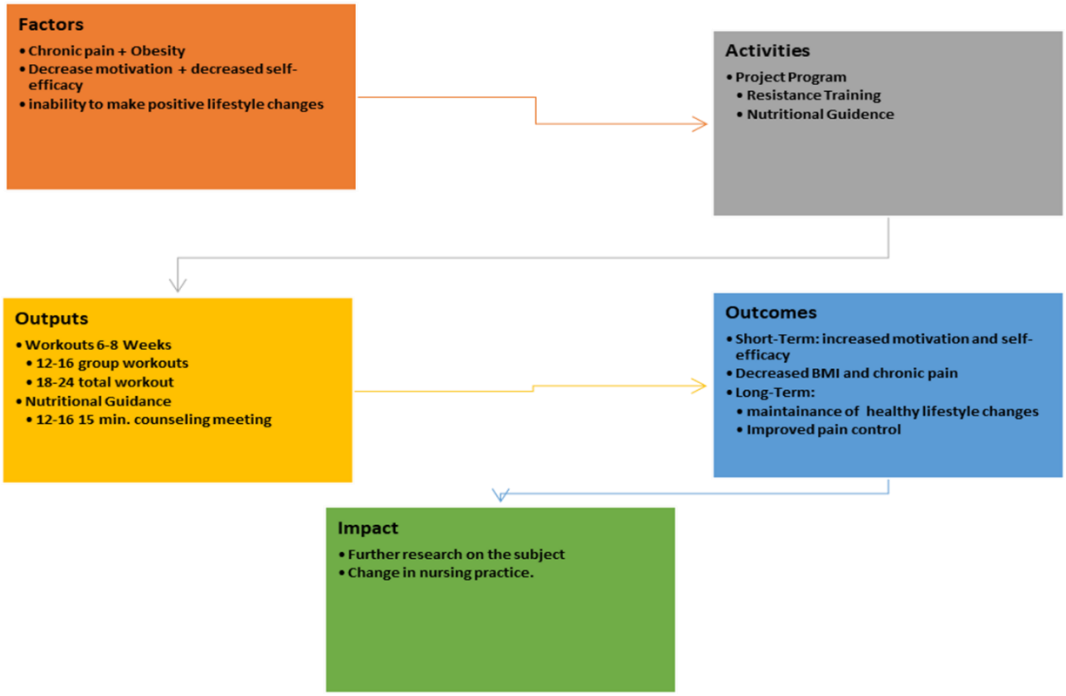
Appendix A

Logical Model

Figure 1

Logic Model



Appendix B

Dietary Material

Figure 2

Caloric Intake

Recommended Caloric Intake							
Activity Level				Activity Level			
Male	Sedentary	Moderately	Active	Female	Sedentary	Moderately	Active
Age				Age			
18	2,400	2,800	3,200	18	1,800	2,000	2,400
19-20	2,600	2,800	3,000	19-20	2,000	2,200	2,400
21-25	2,400	2,800	3,000	21-25	2,000	2,200	2,400
26-30	2,400	2,600	3,000	26-30	1,800	2,000	2,400
31-35	2,400	2,600	3,000	31-35	1,800	2,000	2,200
36-40	2,400	2,600	2,800	36-40	1,800	2,000	2,200
41-45	2,200	2,600	2,800	41-45	1,800	2,000	2,200
46-50	2,200	2,400	2,800	46-50	1,800	2,000	2,200
51-55	2,200	2,400	2,800	51-55	1,600	1,800	2,200
56-60	2,200	2,400	2,600	56-60	1,600	1,800	2,200
61-65	2,000	2,400	2,600	61-65	1,600	1,800	2,000
66-70	2,000	2,200	2,600	66-70	1,600	1,800	2,000

Appendix B

Dietary Material

Figure 3

2015-2020 Dietary Guidelines-USDA Food Patterns: Healthy Mediterranean-Style Eating Pattern.

Calorie Level of Pattern							
	1,000	1,200	1,400	1,600	1,800	2,000	2,200
Food Group	**Daily Amount of Food From Each Group (vegetable and protein foods subgroup amounts are per week)**						
Vegetables	1 c-eq	1½ c-eq	1½ c-eq	2 c-eq	2½ c-eq	2½ c-eq	3 c-eq
Dark-green vegetables (c- eq/wk)	½	1	1	1½	1½	1½	2
Red and orange vegetables (c-eq/wk)	2½	3	3	4	5½	5½	6
Legumes (beans and peas) (c-eq/wk)	½	½	½	1	1½	1½	2
Starchy vegetables (c- eq/wk)	2	3½	3½	4	5	5	6
Other vegetables (c-eq/wk)	1½	2½	2½	3½	4	4	5
Fruits	1 c-eq	1 c-eq	1½ c-eq	2 c-eq	2 c-eq	2½ c-eq	2½ c-eq
Grains	3 oz-eq	4 oz-eq	5 oz-eq	5 oz-eq	6 oz-eq	6 oz-eq	7 oz-eq
Whole grainsd (oz-eq/day)	1½	2	2½	3	3	3	3½
Refined grains (oz-eq/day)	1½	2	2½	2	3	3	3½
Dairy	2 c-eq	2½ c-eq	2½ c-eq	2 c-eq	2 c-eq	2 c-eq	2 c-eq
Protein Foods	2 oz-eq	3 oz-eq	4 oz-eq	5½ oz-eq	6 oz-eq	6½ oz-eq	7 oz-eq
Seafood (oz- eq/wk)f	3	4	6	11	15	15	16
Meats, poultry, eggs (oz-eq/wk)	10	14	19	23	23	26	28
Nuts, seeds, soy products (oz-eq/wk)	2	2	3	4	4	5	5
Oils	15 g	17 g	17 g	22 g	24 g	27 g	29 g
Limit on Calories for Other Uses, calories (% of calories)	150 (15%)	100 (8%)	110 (8%)	140 (9%)	160 (9%)	260 (13%)	270 (12%)

Appendix C

Meal Log

Breakfast					
Food	Serving	Calories	Protein	Carbs/Sugar	Fat
Total					
Lunch					
Food	Serving	Calories	Protein	Carbs/Sugar	Fat
Total					
Dinner					
Food	Serving	Calories	Protein	Carbs/Sugar	Fat
Total					
Daily Total					

Appendix D

Resistance Force Guide

Resistance Force Guide	
Color	**Force**
Yellow	3.0 lbs
Red	3.7 lbs
Green	4.6 lbs
Blue	5.8 lbs
Black	7.3 lbs
Silver	10.2 lbs
Gold	14.2 lbs

Appendix E

Exercises and Routine

Exercises

Exercises			
Dynamic Stretching	**Reps**	**Time**	
squats	varies	1 min	
core twist	varies	3-5 min	
toe touch	varies	3-5 min	
lateral stretch	varies	3-5 min	
Exercises			
	Reps	**Sets**	**Rest**
Upper Body			
Chest Press	10-15	3	1 min
Chest fly	10-15	3	1 min
1-arm lat pulldown	10-15	3	1 min
2- arm lat pulldown	10-15	3	1 min
2 - arm Row	10-15	3	1 min
1-arm row	10-15	3	1 min
bent over row	10-15	3	1 min
back fly	10-15	3	1 min
shoulder press	10-15	3	1 min
upright row	10-15	3	1 min
shoulder rotation	10-15	3	1 min
face pull	10-15	3	1 min
front/side shoulder raise	10-15	3	1 min
bent over side raise	10-15	3	1 min
arm curl	10-15	3	1 min
hammer arm curl	10-15	3	1 min
tricep kick back	10-15	3	1 min
tricep extension	10-15	3	1 min
Core			
twist	10-15	3	1 min
reverse wood chop	10-15	3	1 min
side bend	10-15	3	1 min
Lower body			
squat	10-15	3	1 min
Thruster	10-15	3	1 min
Romanian dead lift	10-15	3	1 min
hip abduction	10-15	3	1 min
hip adduction	10-15	3	1 min
hip flexor	10-15	3	1 min
standing kick back	10-15	3	1 min
pull through	10-15	3	1 min

Workout Routine

Exercises Routine			
Exercises	**Reps**	**Sets**	**Rest**
Dynamic Stretching	3-5 min		
Chest Press	10-15	3	Superset
back fly	10-15	3	1 min
Chest fly	10-15	3	Superset
bent over row	10-15	3	1 min
2- arm lat pulldown	10-15	3	Superset
face pull	10-15	3	1 min
shoulder press	10-15	3	Superset
upright row	10-15	3	1 min
arm curl	10-15	3	Superset
tricep extension	10-15	3	1 min
reverse wood chop	10-15	3	Superset
side bend	10-15	3	1 min
squat	10-15	3	1 min
hip abduction	10-15	3	Superset
hip adduction	10-15	3	1 min
Dynamic Stretching	3-5 min		

Appendix F
Tools

Figure 4

Diet Motivation Tool

Stages of change questionnaire in weight management (S-Weight)

Please answer this questionnaire honestly. Mark with a cross the statement that best describes your current weight situation.

At the moment I'm not doing anything to lose weight and I have no intention of doing anything over the next 6 months	
At the moment I'm not doing anything to lose weight but I'm thinking about doing something over the next 6 months	
During the last year I haven't done anything to lose weight but I'm planning to do something over the next 30 days	
I've been making an effort to lose weight (by dieting1 and/or exercising2) for less than 6 months	
I've been making an effort to maintain my weight (by dieting1 and/or exercising2) for more than 6 months	

Processes of change questionnaire in weight management (P-Weight)

Please answer this questionnaire honestly. Mark with a cross the extent to which you agree or disagree with the statements below, using the following scale:

Questions [1 = Strongly Disagree] [2 = Disagree] [3 = Neutral] [4 = Agree] [5 = Strongly Agree]

1	I think I should eat food with less fat	1	2	3	4	5
2	I look for information about the types of food that could help me lose weight	1	2	3	4	5
3	I try to put food away to avoid nibbling	1	2	3	4	5
4	I now realize I have a weight problem	1	2	3	4	5
5	Society's view of obese people affects me emotionally	1	2	3	4	5
6	I tell myself positive things to avoid overeating	1	2	3	4	5
7	I try not to have food in sight	1	2	3	4	5
8	My weight restricts my relationships	1	2	3	4	5
9	I am worried about gaining more weight	1	2	3	4	5
10	When I really want to eat, I do activities to avoid it	1	2	3	4	5
11	There are no snack foods in my fridge or cupboards*	1	2	3	4	5
12	My current weight makes my daily life difficult	1	2	3	4	5
13	Losing weight would help me improve my relationships with others	1	2	3	4	5
14	I have learnt to control my appetite*	1	2	3	4	5
15	I avoid places where people eat a lot	1	2	3	4	5
16	My family and friends are worried about my weight	1	2	3	4	5
17	Being overweight makes me feel bad	1	2	3	4	5
18	I have learnt skills that reduce my desire to eat (e.g. distracting myself)	1	2	3	4	5
19	When I am on a diet1 I avoid eating with people who I overeat with	1	2	3	4	5
20	Most of my health problems are due to my being overweight	1	2	3	4	5
21	I feel guilty when I overeat	1	2	3	4	5
22	I avoid buying high-calorie food	1	2	3	4	5
23	If I lost weight, I would feel better about myself	1	2	3	4	5
24	I am aware that there are more and more people who encourage me to lose weight	1	2	3	4	5
25	I'm not happy with my current weight	1	2	3	4	5
26	To avoid overeating I prefer eating at home or cooking my own food	1	2	3	4	5
27	If I lost weight, I would be happier	1	2	3	4	5
28	My family and friends praise me for not overeating	1	2	3	4	5
29	I feel good when I am able to control my eating habits	1	2	3	4	5
30	My family and friends congratulate me when I manage to lose weight	1	2	3	4	5
31	When I lose weight, I feel proud of myself	1	2	3	4	5
32	People around me support me in trying to lose weight	1	2	3	4	5
33	I have someone who listens to me when I need to talk about my being overweight	1	2	3	4	5
34	I am committed to losing weight	1	2	3	4	5

Figure 5

Diet Self-efficacy Tool

The DIET Self-Efficacy						
The following questions relate to situations and behaviors that can hinder weight loss or weight control. Please imagine yourself in each of the following situations and rate how confident you are that you could overcome them, using the 5-point scale below. Completely fill in the circle that best indicates how confident you feel that you could overcome the situation.						
Questions						
[0= Not at all confident] [1= A little confident] [2= Moderately confident] [3= Quite confident] [4= Very confident]						
1	You are having dinner with your family and your favorite meal has been prepared. You finish the first helping and someone says, "Why don't you have some more?" How confident are you that you would turn down a second helping?	0	1	2	3	4
2	You often overeat at supper because you are tired and hungry when you get home. How confident are you that you would not overeat at supper?	0	1	2	3	4
3	There is a party at work for a coworker and someone offers you a piece of cake. How confident are you that you would turn it down?	0	1	2	3	4
4	You just had an upsetting argument with a family member. You are standing in front of the refrigerator and you feel like eating everything in sight. How confident are you that you would find some other way to make yourself feel better?	0	1	2	3	4
5	You are invited to someone's house for dinner and your host is an excellent cook. You often overeat because the food tastes so good. How confident are you that you would not overeat as a dinner guest?	0	1	2	3	4
6	You finished your meal and you still feel hungry. There are cakes and fruits available. How confident are you that you would choose the fruits?	0	1	2	3	4
7	You are at a friend's house and your friend offers you a delicious looking pastry. How confident are you that you would refuse this offer?	0	1	2	3	4
8	You are having a hard day at work and you are anxious and upset. You feel like getting a candy bar. How confident are you that you would find a more constructive way to calm down and cope with your feelings?	0	1	2	3	4
9	You feel like celebrating. You are going out with friends to a good restaurant. How confident are you that you would celebrate without overeating?	0	1	2	3	4
10	You are out with a friend at lunch time and your friend suggests that you stop and get some ice cream. How confident are you that you would resist the temptation?	0	1	2	3	4
11	You just had an argument with your boy- friend or girlfriend. You are upset, angry, and you feel like eating something. How confident are you that you would talk the situation over with someone or go for a walk instead of eating?	0	1	2	3	4

Figure 6

Exercise Motivation Tool

Exercise Motivation Inventory – 2 (EMI-2)

On the following pages are a number of statements concerning the reasons people often give when asked why they exercise. Whether you currently exercise regularly or not, please read each statement carefully and indicate, by circling the appropriate number, whether or not each statement is true for you personally, or would be true for you personally if you did exercise. If you do not consider a statement to be true for you at all, circle the '0'. If you think that a statement is very true for you indeed, circle the '5'. If you think that a statement is partly true for you, then circle the '1', '2', '3' or '4', according to how strongly you feel that it reflects why you exercise or might exercise.

Remember, we want to know why you personally choose to exercise or might choose to exercise, not whether you think the statements are good reasons for anybody to exercise.

It helps us to have basic personal information about those who complete this questionnaire. We would be grateful for the following information:

Questions							
1	To stay slim	0	1	2	3	4	5
2	To avoid ill-health	0	1	2	3	4	5
3	Because it makes me feel good	0	1	2	3	4	5
4	To help me look younger	0	1	2	3	4	5
5	To show my worth to others	0	1	2	3	4	5
6	To give me space to think	0	1	2	3	4	5
7	To have a healthy body	0	1	2	3	4	5
8	To build up my strength	0	1	2	3	4	5
9	Because I enjoy the feeling of exerting myself	0	1	2	3	4	5
10	To spend time with friends	0	1	2	3	4	5
11	Because my doctor advised me to exercise	0	1	2	3	4	5
12	Because I like trying to win in physical activities	0	1	2	3	4	5
13	To stay/become more agile	0	1	2	3	4	5
14	To give me goals to work towards	0	1	2	3	4	5
15	To lose weight	0	1	2	3	4	5
16	To prevent health problems	0	1	2	3	4	5
17	Because I find exercise invigorating	0	1	2	3	4	5
18	To have a good body	0	1	2	3	4	5
19	To compare my abilities with other people's	0	1	2	3	4	5
20	Because it helps to reduce tension	0	1	2	3	4	5
21	Because I want to maintain good health	0	1	2	3	4	5

22	To increase my endurance	0	1	2	3	4	5
23	Because I find exercising satisfying in and of itself	0	1	2	3	4	5
24	To enjoy the social aspects of exercising	0	1	2	3	4	5
25	To help prevent an illness that runs in my family	0	1	2	3	4	5
26	Because I enjoy competing	0	1	2	3	4	5
27	To maintain flexibility	0	1	2	3	4	5
28	To give me personal challenges to face	0	1	2	3	4	5
29	To help control my weight	0	1	2	3	4	5
30	To avoid heart disease	0	1	2	3	4	5
31	To recharge my batteries	0	1	2	3	4	5
32	To improve my appearance	0	1	2	3	4	5
33	To gain recognition for my accomplishments	0	1	2	3	4	5
34	To help manage stress	0	1	2	3	4	5
35	To feel more healthy	0	1	2	3	4	5
36	To get stronger	0	1	2	3	4	5
37	For enjoyment of the experience exercising	0	1	2	3	4	5
38	To have fun being active with other people	0	1	2	3	4	5
39	To have fun being active with other people	0	1	2	3	4	5
40	To help recover from an illness/injury	0	1	2	3	4	5
41	Because I enjoy physical competition	0	1	2	3	4	5
42	To stay/become flexible	0	1	2	3	4	5
43	To develop personal skills	0	1	2	3	4	5
44	Because exercise helps me to burn calories	0	1	2	3	4	5
45	To look more attractive	0	1	2	3	4	5
46	To accomplish things that others are incapable of	0	1	2	3	4	5
47	To release tension	0	1	2	3	4	5
48	To develop my muscles	0	1	2	3	4	5
49	Because I feel at my best when exercising	0	1	2	3	4	5
50	To make new friends	0	1	2	3	4	5
51	Because I find physical activities fun, especially when competition is involved	0	1	2	3	4	5
52	To measure myself against personal standards	0	1	2	3	4	5

Figure 7

Exercise Self-efficacy

Exercise Self-efficacy

The items listed below are designed to assess your beliefs in your ability to continue exercising on a three time per week basis at moderate intensities (upper end of your perceived exertion range), for 40+ minutes per session in the future. Using the scales listed below please indicate how confident you are that you will be able to continue to exercise in the future.

For example, if you have complete confidence that you could exercise three times per week at moderate intensity for 40+ minutes for the next four weeks without quitting, you would circle 100%. However, if you had no confidence at all that you could exercise at your exercise prescription for the next four weeks without quitting, (that is, confident you would not exercise), you would circle 0.

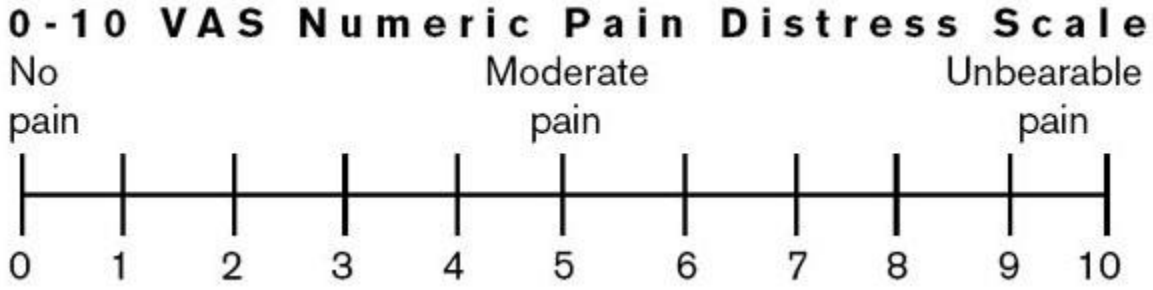
Please remember to answer honestly and accurately. There are no right or wrong answers.
Mark your answer by circling a number:

Questions

1. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the **NEXT WEEK**											
0	1	2	3	4	5	6	7	8	9	10	
2. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the **NEXT TWO WEEKS**											
0	1	2	3	4	5	6	7	8	9	10	
3. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the **NEXT THREE WEEKS**											
0	1	2	3	4	5	6	7	8	9	10	
4. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the **NEXT FOUR WEEKS**											
0	1	2	3	4	5	6	7	8	9	10	
5. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the **NEXT FIVE WEEKS**											
0	1	2	3	4	5	6	7	8	9	10	
6. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the **NEXT SIX WEEKS**											
0	1	2	3	4	5	6	7	8	9	10	
7. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the **NEXT SEVEN WEEKS**											
0	1	2	3	4	5	6	7	8	9	10	
8. I am able to continue to exercise three times per week at moderate intensity, for 40+ minutes without quitting for the **NEXT EIGHT WEEKS**											
0	1	2	3	4	5	6	7	8	9	10	

Figure 8

VAS Pain Scale



Appendix G
Letters of Agreement

Figure 9

Adult Medicine Specialist
314 West 16th Street
Pueblo, Co. 81003
Letter of Agreement

10/23/2019

To Regis University Institutional Review Board (IRB):

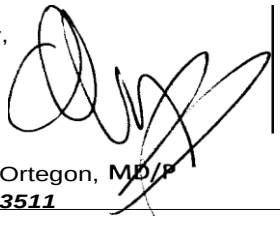
I am familiar with Greg Grahek's QI project entitled "The Difference in Motivation and Self-Efficacy following Resistance Training and Individualized Diet Planning for Obese Patients with Chronic Pain". I understand Adult Medicines Specialist clinic involvement is to allow Mr. Grahek to invite clinic patients who meet the inclusion criteria to participate in the QI study. The inclusion criteria for the study are adults with concurrent diagnoses of obesity and chronic pain. The age criterion is 18 to 65 years old. Obesity criteria is defined by having a BMI greater than 29.9. Chronic musculoskeletal pain is defined as persistent or recurrent pain lasting greater than three months. Chronic pain is also limited to nociceptive pain and must not arise from pain caused by neuropathy or somatic-referred pain. Further, inclusion criteria are medical clearance by primary researcher or the subject primary care provider. The study will be open to all patients who meet the inclusion criteria and have signed an informed consent.

I am aware of the risks to the patients who precipitant in the study which are described below. The subjects will be exposed to guided resistance band training which will place them at minimal risk. This intervention is considered minimal risk because it places the subjects at no greater probability of harm or discomfort than that which would ordinarily be encountered in their daily lives.

I am aware that this QI study goal is to improve motivation and self-efficacy of AMS patients to continue a treatment plan of diet and exercise which is designed to improve BMI and chronic pain management. Although beyond the scope of this project, a long-term goal is to decrease the level of chronic pain, see five to ten percent body mass loss, and decrease the co-morbidities associated with obesity. Furthermore, the project maybe be utilized as a pilot study for future developments of an evidence-based standard of practice within this population.

I understand that this QI project will be carried out following sound ethical principles and that participant involvement in this QI project is strictly voluntary and provides confidentiality of QI data, as described in the proposal. Therefore, as a representative of Adult Medicine Specialist, I agree that Greg Grahek's QI project may be conducted at our agency/institution.

Sincerely,



Anthony Ortegon, MD/P
719-546-3511

Figure 10

Fit-Fast-Strong CrossFit
Letter of Agreement

10/23/2019

To Regis University Institutional Review Board (IRB):

I am familiar with Greg Grahek's QI project entitled "The Difference in Motivation and Self-Efficacy following Resistance Training and Individualized Diet Planning for Obese Patients with Chronic Pain". I understand Fit-Fast-Strong CrossFit's involvement will be to allow access to our gym facilities. Access two times a week for a 6-week period, for one hour a day to the gym's open training room. During that time, the primary investigator will lead a 45 minute resistance band exercise class and 15-minute counseling session.

I understand this QI will be carried out following sound ethical principles and the participant's involvement in this QI project is strictly voluntary, and will provide confidentiality of QI data, as described in the proposal.

Therefore, as a representative of Fit-Fast-Strong CrossFit, I agree that Greg Grahek's QI project may be conducted at our agency/institution.

Sincerely,

Chris Campos, President
719-429-4993

Appendix H

IRB Approval Letter

REGIS UNIVERSITY

REGIS.EDU

Institutional Review Board

DATE:	October 29, 2019
TO:	Gregory Grahek
FROM:	Regis University Human Subjects IRB
PROJECT TITLE:	[1517475-1] The Difference in Motivation and Self-Efficacy following resistance training and individualized diet planning for obese patients with chronic pain
SUBMISSION TYPE:	New Project
ACTION:	DETERMINATION OF NOT RESEARCH
DECISION DATE:	October 29, 2019

Thank you for your submission of New Project materials for this project. The Regis University Human Subjects IRB has determined this project does not meet the definition of human subject research under the purview of the IRB according to federal regulations.

This QI project may proceed.

We will retain a copy of this correspondence within our records.

If you have any questions, please contact the Institutional Review Board at irb@regis.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Regis University Human Subjects IRB's records.

Appendix I

Statistical Tests

Table 4

Cronbach's Alpha

Cronbach's Alpha			Internal Consistency (IC)	
Tool	**Alpha**	**IC**	**Level**	**Alpha**
S&P Weight	**0.946**	**Excellent**	**Excellent**	**α≥ 0.9**
Diet-SE	**0.508**	**Poor**	**Good**	**α≥ 0.8**
EMI-2	**0.911**	**Excellent**	**Acceptable**	**α≥ 0.6**
EXSE	**0.033**	**Poor**	**Poor**	**α≤ 0.6**

Table 5

Demographic Paired Statistics

Statistics				
	Pre-Pain Level	**Post-Pain Level**	**Pre-Weight**	**Post-Weight**
N	10	10	10	10
Median	5.0	4.0	227.5	225.0
Mean	5.2	3.8	234.7	229.6

Table 6

Frequency of Pain Pre and Post

Pre-Intervention Pain			Post-Intervention Pain		
Pain level	**Frequency**	**Valid Percent**	**Pain Level**	**Frequency**	**Valid Percent**
2			2	2	20.00
3	1	10.00	3	2	20.00
4	3	30.00	4	4	40.00
5	2	20.00	5		
6	2	20.00	6	2	20.00
7	1	10.00	7		
8	1	10.00	8		
Total	10.00	100.00	**Total**	10.00	100.00
Range	3-8		**Range**	2-6	

Table 7

Paired Sample Statistics & Correlation

Paired Sample Statistics & Correlation					
Primary Variables					
Tool	**Mean**	**Std. Deviation**	**Std. Error Mean**	**Pearson Correlation**	**Sig.**
S-weight Pre	3.50	0.7071	0.2236	0.900	0.489
S-weight Post	4.10	0.3162	0.1000		
P-Weight Pre	26.13	13.6084	2.1517	0.248	0.000
P-Weight Post	29.53	12.7319	2.0131		
DIET-SE Pre	7.90	3.8448	0.7020	0.341	0.066
DIET-SE Post	11.33	3.6609	0.6684		
EMI-2 Pre	49.40	16.3954	2.5923	0.836	0.000
EMI-2 Post	49.03	16.9547	2.6808		
EXSE Pre	8.10	1.4196	0.1587	0.024	0.835
EXSE Post	9.80	0.6038	0.0675		
Secondary Variables					
BMI-Pre	40.84	6.5308	2.0652	0.993	0.000
BMI-Post	39.98	6.1474	1.9440		
Pain Pre	5.20	1.5492	0.4899	0.994	0.000
Pain Post	3.80	1.3984	0.4422		
Wt Pre	234.70	33.4666	10.5831	0.994	0.000
Wt post	229.60	30.2552	9.5675		

Table 8

Pearson Correlation Primary Variables

Correlations

		SPPre	SPPost	DSFPre	DSFPost	EMIPre	EMIPost	ESFPre	ESFPost
SPPre	Pearson Correlation	1	.900**	.024	.013	.343*	.387*	.174	.065
	Sig. (2-tailed)		.000	.900	.945	.030	.014	.282	.690
	N	40	40	30	30	40	40	40	40
SPPost	Pearson Correlation	.900**	1	.107	.030	.104	.233	.128	.061
	Sig. (2-tailed)	.000		.575	.874	.524	.147	.432	.710
	N	40	40	30	30	40	40	40	40
DSFPre	Pearson Correlation	.024	.107	1	.341	-.018	.111	.076	-.295
	Sig. (2-tailed)	.900	.575		.066	.925	.558	.691	.113
	N	30	30	30	30	30	30	30	30
DSFPost	Pearson Correlation	.013	.030	.341	1	.224	.174	-.014	.286
	Sig. (2-tailed)	.945	.874	.066		.235	.358	.942	.125
	N	30	30	30	30	30	30	30	30
EMIPre	Pearson Correlation	.343*	.104	-.018	.224	1	.836**	.147	.290
	Sig. (2-tailed)	.030	.524	.925	.235		.000	.364	.069
	N	40	40	30	30	40	40	40	40
EMIPost	Pearson Correlation	.387*	.233	.111	.174	.836**	1	.322*	.374*
	Sig. (2-tailed)	.014	.147	.558	.358	.000		.043	.017
	N	40	40	30	30	40	40	40	40
ESFPre	Pearson Correlation	.174	.128	.076	-.014	.147	.322*	1	.024
	Sig. (2-tailed)	.282	.432	.691	.942	.364	.043		.835
	N	40	40	30	30	40	40	80	80
ESFPost	Pearson Correlation	.065	.061	-.295	.286	.290	.374*	.024	1
	Sig. (2-tailed)	.690	.710	.113	.125	.069	.017	.835	
	N	40	40	30	30	40	40	80	80

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

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

Table 9

Pearson Correlation Demographic and Secondary Variables

Correlations

		BMIPre	BMIPost	PainPre	PainPost	WtPre	Wtpost	Age	Gender	SPPre	DSFPre	EMIPre	ESFPre	StgchngPre	StgchngPost
BMIPre	Pearson Correlation	1	.993**	-.378	-.572	.757*	.769**	-.508	.536	.024	.654*	-.031	.c	-.360	-.407
	Sig. (2-tailed)		.000	.282	.084	.011	.009	.134	.110	.948	.040	.933	.000	.307	.243
	N	10	10	10	10	10	10	10	10	10	10	10	10	10	10
BMIPost	Pearson Correlation	.993**	1	-.415	-.585	.707*	.730*	-.560	.563	.012	.650*	.003	.c	-.335	-.399
	Sig. (2-tailed)	.000		.234	.075	.022	.017	.092	.090	.974	.042	.992	.000	.343	.253
	N	10	10	10	10	10	10	10	10	10	10	10	10	10	10
PainPre	Pearson Correlation	-.378	-.415	1	.944**	-.168	-.204	.812**	-.356	.521	-.382	.228	.c	-.203	.408
	Sig. (2-tailed)	.282	.234		.000	.643	.571	.004	.312	.123	.276	.527	.000	.574	.242
	N	10	10	10	10	10	10	10	10	10	10	10	10	10	10
PainPost	Pearson Correlation	-.572	-.585	.944**	1	-.355	-.370	.815**	-.428	.478	-.550	.352	.c	-.112	.553
	Sig. (2-tailed)	.084	.075	.000		.314	.293	.004	.218	.162	.099	.318	.000	.757	.097
	N	10	10	10	10	10	10	10	10	10	10	10	10	10	10
WtPre	Pearson Correlation	.757*	.707*	-.168	-.355	1	.994**	-.124	-.006	-.168	.415	.020	.c	-.115	-.028
	Sig. (2-tailed)	.011	.022	.643	.314		.000	.732	.986	.643	.234	.955	.000	.752	.938
	N	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Wtpost	Pearson Correlation	.769**	.730*	-.204	-.370	.994**	1	-.168	-.002	-.195	.409	.071	.c	-.083	.005
	Sig. (2-tailed)	.009	.017	.571	.293	.000		.643	.997	.590	.240	.846	.000	.819	.990
	N	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Age	Pearson Correlation	-.508	-.560	.812**	.815**	-.124	-.168	1	-.349	.366	-.424	.321	.c	-.148	.562
	Sig. (2-tailed)	.134	.092	.004	.004	.732	.643		.323	.298	.222	.366	.000	.683	.091
	N	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Gender	Pearson Correlation	.536	.563	-.356	-.428	-.006	-.002	-.349	1	.182	.428	.074	.c	-.488	-.509
	Sig. (2-tailed)	.110	.090	.312	.218	.986	.997	.323		.616	.217	.839	.000	.153	.133
	N	10	10	10	10	10	10	10	10	10	10	10	10	10	10
SPPre	Pearson Correlation	.024	.012	.521	.478	-.168	-.195	.366	.182	1	.024	.343*	.174	-.700*	-.260
	Sig. (2-tailed)	.948	.974	.123	.162	.643	.590	.298	.616		.900	.030	.282	.024	.469
	N	10	10	10	10	10	10	10	10	40	30	40	40	10	10
DSFPre	Pearson Correlation	.654*	.650*	-.382	-.550	.415	.409	-.424	.428	.024	1	-.018	.076	-.204	-.770**
	Sig. (2-tailed)	.040	.042	.276	.099	.234	.240	.222	.217	.900		.925	.691	.573	.009
	N	10	10	10	10	10	10	10	10	30	30	30	30	10	10
EMIPre	Pearson Correlation	-.031	.003	.228	.352	.020	.071	.321	.074	.343*	-.018	1	.147	.160	.362
	Sig. (2-tailed)	.933	.992	.527	.318	.955	.846	.366	.839	.030	.925		.364	.659	.304
	N	10	10	10	10	10	10	10	10	40	30	40	40	10	10
ESFPre	Pearson Correlation	.c	.c	.c	.c	.c	.c	.c	.c	.174	.076	.147	1	.c	.c
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.282	.691	.364		.000	.000
	N	10	10	10	10	10	10	10	10	40	30	40	80	10	10
StgchngPre	Pearson Correlation	-.360	-.335	-.203	-.112	-.115	-.083	-.148	-.488	-.700*	-.204	.160	.c	1	.248
	Sig. (2-tailed)	.307	.343	.574	.757	.752	.819	.683	.153	.024	.573	.659	.000		.489
	N	10	10	10	10	10	10	10	10	10	10	10	10	10	10
StgchngPost	Pearson Correlation	-.407	-.399	.408	.553	-.028	.005	.562	-.509	-.260	-.770**	.362	.c	.248	1
	Sig. (2-tailed)	.243	.253	.242	.097	.938	.990	.091	.133	.469	.009	.304	.000	.489	
	N	10	10	10	10	10	10	10	10	10	10	10	10	10	10

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

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

c. Cannot be computed because at least one of the variables is constant.

Table 10

Paired t-test Primary Variables

Paired Samples t-Test								
Tool	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
S-weight Pre/Post	-0.6000	0.6992	0.2211	-1.1002	-0.0998	-2.714	9	0.024
P-Weight Pre/Post	-3.4000	5.9519	0.9411	-5.3035	-1.4965	-3.613	39	0.001
DIET-SE Pre/Post	-3.4333	4.3126	0.7874	-5.0437	-1.8230	-4.360	29	0.000
EMI-2 Pre/Post	0.3750	9.5560	1.5109	-2.6812	3.4312	0.248	39	0.805
EXSE Pre/Post	-1.7000	1.5295	0.1710	-2.0404	-1.3596	-9.942	79	0.000

Table 11

Paired t-test Secondary Variables

Paired Samples Test								
Tool	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
BMIPre - BMIPost	0.85600	0.831	0.2628	0.2615	1.4505	3.2573	9	0.010
PainPre - PainPost	1.400	0.516	0.1633	1.0306	1.7694	8.5732	9	0.000
WtPre - Wtpost	5.100	4.771	1.5089	1.6867	8.5133	3.3800	9	0.008

Table 12

ANOVA

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
BMIPre	Between Groups	110.309	1	110.309	3.226	.110
	Within Groups	273.557	8	34.195		
	Total	383.865	9			
PainPre	Between Groups	2.743	1	2.743	1.164	.312
	Within Groups	18.857	8	2.357		
	Total	21.600	9			
WtPre	Between Groups	.386	1	.386	.000	.986
	Within Groups	10079.714	8	1259.964		
	Total	10080.100	9			
SPPre	Between Groups	42.076	1	42.076	.273	.616
	Within Groups	1233.524	8	154.190		
	Total	1275.600	9			
DSFPre	Between Groups	29.719	1	29.719	1.796	.217
	Within Groups	132.381	8	16.548		
	Total	162.100	9			
EMIPre	Between Groups	11.433	1	11.433	.044	.839
	Within Groups	2078.667	8	259.833		
	Total	2090.100	9			
ESFPre	Between Groups	.000	1	.000	.	.
	Within Groups	.000	8	.000		
	Total	.000	9			
StgchngPre	Between Groups	1.071	1	1.071	2.500	.153
	Within Groups	3.429	8	.429		
	Total	4.500	9			