

University of Nevada, Reno

**The Additive Effects of Online Values Clarification and Goal-Setting Training on  
Measures of a Weight Management System**

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of  
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by

Daniel Reimer

Dr. Ramona A. Houmanfar/Dissertation Advisor

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We recommend that the dissertation  
prepared under our supervision by

**DANIEL REIMER**

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be accepted in partial fulfillment of the  
requirements for the degree of

DOCTOR OF PHILOSOPHY

Ramona Houmanfar, PhD, Advisor

Mark Alavosius, PhD, Committee Member

Abbie Beacham, PhD, Committee Member

Evan Klass MD, Committee Member

W. Larry Williams, PhD, Committee Member

John Packham, PhD, Graduate School Representative

David W. Zeh, Ph. D., Dean, Graduate School

December, 2016

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## Abstract

Obesity in the United States is an urgent issue that the nation must address. Current estimations indicate that overweight and obesity trends are increasing, resulting in more individuals who are overweight or obese and increases in morbidity and mortality. Therefore, it is important to research strategies to make weight management more effective. One approach is to add components to already successful weight management programs in order to boost their long-term effectiveness. The literature indicates that a combination of goal setting and values clarification training can have a significant effect on long-term behavior change. The current research presents the results of adding a goal setting and values clarification training component to an already successful weight management program.

*Keywords:* Weight loss, values, goals, online modules, HMR

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## The Additive Effects of Online Values Clarification and Goal-Setting Training on Measures of a Weight Management System

Obesity in the United States has reached epidemic proportions, with recent numbers showing millions of people in the US, an estimated 35% of the population, qualify as obese according to age-adjusted BMI ratings (Bertakis & Azari, 2004; Flegal, Carroll, Kit, & Ogden, 2012; Kuczmarski, Flegal, Campbell, & Johnson, 1994) with some estimates as high as 50% (Flegal, Carroll, Kuczmarski, & Johnson, 1998; Must, et al., 1999) or 66% (National Center for Health Statistics, 2005) for those qualifying as either obese or overweight. If trends continue, it is estimated that 75% of Americans will be overweight by 2020 (Sassi, 2010). The ramifications of such wide scale obesity are profound and can dramatically affect the lives of the general population both directly and indirectly. Unfortunately, current trends indicate that there has been little deceleration to the perpetual increase in overweight and obesity rates. Accordingly, there is a large body of literature exploring both the direct and indirect implications of obesity in a number of different areas; such as health outcomes and morbidity, mortality, quality of life, economics and health care system utilization.

### **Morbidity/Health Outcomes**

The effect of overweight and obesity on other health factors and disease diagnoses has perhaps been the most extensively studied. Overweight and obesity has been linked to many serious health problems including cardiovascular disease (Asia Pacific Cohort Studies, Collaboration, 2006; Burton, Foster, Hirsch, & VanItallie, 1985; Must, et al., 1999; Rexrode, Buring, & Manson, 2001; Rexrode, et al., 1998; Shaper, Wannamethee,

& Walker, 1997; Wang, McPherson, Marsh, Gortmaker, & Brown, 2011; Wannamethee, Shaper, & Walker, 2005), hyperglycemia (Manson, Skerrett, & Willett, 2001), stroke (Kurth, et al., 2002; Jood, Jern, Wilhelmsen, & Rosengren, 2004; Manson, Skerrett, & Willett, 2001; Shaper, Wannamethee, & Walker, 1997; Wang, McPherson, Marsh, Gortmaker, & Brown, 2011), type 2 diabetes mellitus (Chan, Rimm, Colditz, Stampfer, & Willett, 1994; Harris, et al., 1998; Hartemink, Boshuizen, Nagelkerke, Jacobs, & van Houwelingen, 2006; Hu, et al., 2001; Manson, Skerrett, & Willett, 2001; Meisinger, Doring, Thorand, Heier, & Lowel, 2006; Must, et al., 1999; Shaper, Wannamethee, & Walker, 1997; Wang, McPherson, Marsh, Gortmaker, & Brown, 2011; Wannamethee, Shaper, & Walker, 2005) gallbladder disease (Must, et al., 1999), osteo-arthritis (Burton, Foster, Hirsch, & VanItallie, 1985; Must, et al., 1999; Wang, McPherson, Marsh, Gortmaker, & Brown, 2011), metabolic syndromes (Arden, Katzmarzk, Janssen, & Ross, 2003; Janssen, Katzmarzyk, & Ross, 2002) and some forms of cancer, (Bergstrom, Pisani, Tenet, Wold, & Adami, 2001; Burton, Foster, Hirsch, & VanItallie, 1985; Harvie, Hooper, & Howell, 2003; Lukanova, et al., 2006; MacInnis & English, 2006; Wang, McPherson, Marsh, Gortmaker, & Brown, 2011). This is just a small sample of the research that has been conducted regarding increases in these diseases (cardiovascular disease, hyperglycemia, stroke, type 2 diabetes, gallbladder disease, osteo-arthritis, metabolic syndromes and cancer); there is clearly substantial literature that support the negative health concerns of overweight or obese individuals.

### **Mortality**

There is also been a substantial amount of research demonstrating the mortality rates of the overweight and obese. Publications have calculated mortality rates three main ways. A number of studies have estimated the annual national death toll, with the number of deaths due to obesity being estimated at between 300,000 and 500,000 (Allison, Fontaine, Manson, Stevens, & Van Itallie, 1999; Amler & Eddins, 1987; Forster, 1995; Hill & Trowbridges, 1998; McGinnis & Eddins, 1993). Other studies have focused on the individual probability of mortality, estimating that death is 20 to 40 percent more likely to occur for the overweight and two to three times more likely to occur for the obese (Adams, et al., 2006; Berrington de Gonzalez, et al., 2010) with increases in mortality seen with specific diseases and disorders such as respiratory and vascular diseases, and cancer (Prospective Studies Collaboration, 2009).

More recently, there has been a trend in the literature towards calculating the “years of life lost,” (YLL). It is a relatively new area of research; however, it has been proposed as a more salient statistic to discuss with an individual with overweight or obesity. Fontain, Redden, Wang, Westfall, and Allison (2003) suggest that YLL is a way to make the deleterious outcomes of overweight and obesity more understandable, and therefore encourage weight loss for those who are overweight or obese. Fontain et. al. argue that YLL is a number that pertains directly to an individual, instead of a national mortality rate or a statistical probability. The estimated YLL is calculated using the Body Mass Index (BMI) for each adult year of life, the hazard ratio for death for the specific BMI level of that individual and the probability of death for each adult year of life. It essentially predicts the number of years that are reduced from an individual’s life due to overweight or obesity. In some cases, it has been used in place of other, more traditional

measures of mortality (Fontain, Redden, Wang, Westfall, & Allison, 2003; Stevens, 2000). Generally, it was found that a maximum of 13 years for men, 8 years for women were lost due to obesity. Depending on other variables factoring in to life-expectancy, this could mean a reduction in as high as 20% of life-expectancy for the obese.

### **Quality of Life**

While not as heavily researched as the long-term implications on morbidity and mortality, the decline in the quality of life experienced by individuals who are overweight or obese is perhaps the most germane outcome of overweight or obesity since it has an immediate and detrimental effect on the individual. A review of the quality of life literature determined that individuals experience a significant decrease in their quality of life as a result of their obesity, with a negative correlation between level of obesity and quality of life (Fontaine & Bartlett, 1998; Kolotkin, Meter, & Williams, 2001). This decrease in quality of life can manifest in many different ways, such as depression (Bertakis & Rahman, 2005; Doll, Peterson, & Stewart-Brown, 2000; Erikson, Robinson, Haydel, & Killen, 2000; Strauss, 2000; Swallen, Reither, Haas, & Meier, 2005), low self-esteem (Erikson, Robinson, Haydel, & Killen, 2000; Faith, Manibay, Kravitz, Griffith, & Allison, 1998; Kaplan & Wadden, 1986; Strauss, 2000; Swallen, Reither, Haas, & Meier, 2005) and diminished general health (Dietz, 1998; Doll, Peterson, & Stewart-Brown, 2000; Swallen, Reither, Haas, & Meier, 2005). The alteration in quality of life has been suggested to decrease both as a function of increasing BMI as well as an increase in co-morbidities (Kushner & Foster, 2000), depicting an interplay between weight, morbidity caused by weight and a decrease in perceived quality of life, though it should be noted

there is evidence that quality of life can decrease independently of morbidity and weight (Seidell, 1995).

Many costs are associated with overweight and obesity, all of which are substantial. There are costs to personal health and well-being, quality of life, wellness, and longevity. There are costs to the healthcare system which increase substantially for the overweight and obese. There are substantial costs to society, both direct and indirect. Research must be done to curb the overweight and obesity trend, and to ameliorate individuals who are currently overweight or obese.

### **Background and Significance**

As demonstrated, overweight and obesity is a substantial problem in the United States, with long-term ramifications if proper care models are not developed to address individuals who are overweight or obese. Obesity as a national problem has become so prevalent that former Surgeon General David Satcher indicated that other health gains in areas such as heart disease, chronic health problems, and some types of cancer could be lost if obesity is not adequately addressed (Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity, 2001).

There is a large literature exploring the benefits of weight loss in a number of different areas such as improvement in health, increases in quality of life, financial savings and a decreased utilization of health care services. These are often the converse of the detriments that have already been mentioned, with the reversal or even benefits being seen with weight loss. It has been shown that even modest weight loss can be beneficial to the overweight or obese. Losses as small as 5% have been found to reduce

or eliminate complications and co-morbidities of overweight and obesity (Blackburn, 1995; Pasanisi, Contaldo, de Simone, & Mancini, 2001).

In addition, studies have shown substantial improvements in regards to reported quality of life after weight loss (Fontaine, Cheskin, & Barofsky, 1996; Hafner, Watts, & Rogers, 1991; Karlsson, Taft, Ryden, Sjostrom, & Sullivan, 2007; Rand & MacGregor, 1994). Swallen, Reither, Haas, and Meier (2005) identified four dimensions of health related quality of life; general, physical and emotional health as well as social functioning. Their analysis concluded that there were statistically significant differences in the quality of life for children who were overweight and obese, particularly in the general health and physical health dimensions.

Similarly, another study found that quality of life measures increased significantly at the end of a 12-week weight loss program (Rippe, et al., 1998). A group of women were randomly assigned to a 12-week weight loss intervention or to a control group. The weight loss program included the promotion of physical activity, a decreased caloric diet and weekly group support sessions. Physical measures such as weight and body fat percentage were taken pre-post, but in addition each group took a number of psychological batteries and the Medical Outcomes Study 36 item Short Form Health Survey (SF-36). Though causation was not proven, there was a statistically significant difference in weight loss, body fat percentage and quality of life measures for the intervention group when compared to the control, with the control group remaining approximately the same for both the physical measures as well as the quality of life measures.

**Financial savings.** Substantial costs can potentially be saved by decreasing the prevalence of obesity. A complex simulation model developed in the UK determined that the administration of a weight loss program, “Counterweight,” to a randomly selected population would not only be cost-effective based on the effectiveness previously reported by “Counterweight,” but actually saved money when analyzed over a two year period (Haynes, et al., 2010). Similarly, a study conducted by the CDC analyzed the estimated cost effectiveness and cost savings of seven empirical weight loss programs (Roux, et al., 2008). It determined that, though cost-effectiveness varied between programs, all were cost-effective when estimated 10, 20, 30 and 40 years into the future, with an estimated \$147,000 savings for an individual over a 40-year time period per year for the most successful of the seven interventions. The monetary savings for an individual has also been calculated. There is research showing an estimated 63% decrease in prescription drug costs after losing an average of 33 pounds in a 12-week weight loss program; an estimated \$442 a year per individual (Collins & Anderson, 1995).

There is a plethora of benefits that can be achieved by losing weight. However, identifying the benefits of weight loss is not enough. It is important to investigate appropriate and effective ways to reduce and manage weight for those who are considered overweight or obese. A large body of research elucidates multiple ways that overweight and obesity can be treated to ameliorate the negative outcomes and increase the positive outcomes aforementioned.

A number of interventions have been researched and can be categorized as dietary, psychological, pharmaceutical and surgical. While dietary, pharmacological and surgical interventions are prevalent and can potentially be successful weight loss strategies, they are outside the focus of this paper to discuss as they are not interventions that are typically initiated by psychologists. Instead, the next section will focus on the two main types of psychological interventions; behavioral and cognitive.

**Behavioral interventions.** The first to study behavior and weight loss was Ferster, Nurnberger and Levitt (1962), with other initial research to follow (Foreyt & Goodrick, 1993; Stuart, 1971; Stunkard, 1975). These studies attributed overweight and obesity to excess behavior, such as eating. Behavioral interventions in this line of research aims at decreasing stimulus control on eating. A majority of studies conducted in the field of behavior use some form of behaviorally based weight loss interventions; self-monitoring, stimulus control, contingency management, and changing behavior parameters (Foreyt & Goodrick, 1993).

Another major strategy commonly used in the behavioral literature is contingency management. Washington, Banna, & Gibson (2014) equipped eleven participants with Fitbit accelerometers for three weeks. Participants were entered into a lottery in accordance with their reported levels of physical activity. The determining factors for the lottery criteria were based on percentile schedules, so that an increase in physical activity was needed in order to reach their goal. Results demonstrate that participants increased their overall activity (by minute) per day. In addition, there was a marked decrease in the latency between active minutes. A similar study by De Luca & Holborn (1992) recruited



a group of pre-teen boys to determine if usage of a stationary bicycle could be increased. They used a changing criterion design to award points on a variable-ratio schedule during the treatment phase when the participants were active on the bike. Results showed that response rates were high, regardless of whether or not the participants were considered obese. Weight measures were not included, but there was anecdotal evidence provided in the research that a participant dropped four pant sizes while participating in the study.

A newer strategy for behavioral weight loss change is “exergaming.” Exergaming is where physical activity is a major component in a video, such as moving your character by miming walking, instead of pressing button to make the videogame character move. There have been numerous studies (Fogel, Miltenberger, Graves, & Koehler, 2010; Shayne, Fogel, Miltenberger, & Koehler, 2012; Van Camp & Hayes, 2012) that altering the topography required to play a video game (e.g. “walking” instead of button pressing to move a character), increases physical activity in the gamer compared to typical, button pressing topography. For example, Fogel, Miltenberger, Graves, & Koehler (2010) integrated popular exergames (e.g. Dance Dance Revolution, Gamercize with Batman and Robin, Nintendo Wii Boxing, etc.) into a physical education classroom with an alternating treatments design; where the exergames were available to participating students every other session. Participants’ activity levels when the exergames were available compared to when they were not available was substantial, an estimated 70% increase overall.

**Cognitive interventions.** Cognitive interventions have played a role in weight management. ~~interventions.~~ Most frequently they include interventions with self-

efficacy and self-control (Clark, Abrams, Niaura, Eaton, & Rossi, 1991; Linde, Rothman, Baldwin, & Jeffery, 2006; Mahoney, Moura, & Wade, 1973), coping strategies and health education (Brown, 1992; Puhl & Brownell, 2006). In short, these strategies attempt to alter a person's thinking and interaction with private stimuli. It is worth noting that some cognitive interventions include measurement and/or discussion of neurology and physiology (Joseph, Alonso-Alonso, Bond, Pascual-Leone, & Blackburn, 2011). However, a discussion of the physiological and neurological underpinnings of hunger, eating, satiation, and the biological mechanisms which contribute to overweight and obesity are outside the scope of this paper as these aspects of weight gain, though important, are not subject to experimental manipulation by psychologists.

One main cognitive strategy to support weight loss is the modification of a patient's self-efficacy, or the belief that they can lose weight. For example, a study conducted by Rapoport, Clark, & Wardle (2000) included cognitive-behavioral strategies for developing self-control with participants such as the modification of self-defeating cognitions, cognitive restructuring, and exposure and response prevention. These strategies were delivered using cognitive-behavioral therapy methods in a group setting, in addition to education sessions on topics such as healthy eating habits and exercise. Results suggest success of the intervention, with 87% of participants losing weight compared to their baseline weight, though the results decreased to 53% by a 52-week follow-up with 47% of the participants having gained weight compared to baseline.

A treatment plan based on cognitive science, developed by Cooper & Fairburn (2001), focusing heavily on education (managing weight v. losing weight), self-

regulation (establishing a personal eating plan), coping strategies and addressing environmental variables (identifying barriers and strategizing to remove them) and motivation with a follow-up phase meant to encourage and maintain a healthy lifestyle long term. This is a typical cognitive intervention that emphasizes motivation and “appropriate cognitive responses,” to the weight loss/management process, with self-efficacy for following the rules created under a diet plan. Included in this particular program is “the practice of behavioral skills” in addition to the cognitive aspects just discussed, though it is listed last on the list of strategies used by the weight management plan.

Cognitive research has demonstrated a connection between mood and food consumption (Herman & Polivy, 1975; Macht, 1999; Macht, 2008; Patel & Schlundt, 2001; Ruderman, 1985). These results have driven a line a cognitive weight loss research that emphasizes the necessity of mediating mood. For example, Hasler, et al. (2005) focused on eating as a result of depression. A large group of young adults (n=591) were tracked over a 40-year period with a focus on physical measurements such as weight and BMI, behavior such as physical activity, as well as symptomology of depression as defined by the Structured Psychopathological Interview and Rating of the Social Consequences for Epidemiology (SPIKE) designed for the DSM-IV diagnoses of mental disorders. Results suggested that individuals who displayed depressive symptoms before the age of 17 were at greater risk for overweight an obesity, though women with depressive symptoms were more prone to weight than their male counterparts. The authors also conclude that more work should be done to decrease depressive symptomology in adolescents to decrease the prevalence of obesity.

A historic study by Keys, Brozek, Henschel, Mickelsen, & Taylor (1950) also informs the changes in cognition during weight loss, with results suggesting that weight loss can be associated with changes in mood, results in apathy, depression, irritability and moodiness. It was suggested that the process of losing weight results in these changes to mental status regardless of the original weight of the individual. If this supposition is accurate, it means that an overweight or obese individual will experience many negative behavioral and physiological changes as they lose weight, even if their weight remains in the overweight or obese range (Berry, 1999).

**Critical review of current interventions.** Though success is often reported for each of the aforementioned psychological strategies for obesity interventions, each has shortcomings which must be addressed. While most weight management interventions prove effective at helping individuals lose weight initially, most interventions are only temporary and report a gradual return to baseline weight once the treatment is completed (Foreyt & Goodrick, 1993; Garner & Wooley, 1991; Jeffery, et al., 2000; Perri, Nezu, & Viegner, 1993; Schlundt, Sbrocco, & Bell, 1989). These results are often because the interventions are only effective while they are being implemented, with the effects disappearing once they are discontinued. This is most likely since an intervention is required to continue response maintenance; as soon as the intervention is discontinued the benefits of the intervention also disappear. In other words, the contingencies in place which effectively promote weight loss during the intervention are required to maintain the weight loss behavior and when the intervention is removed, the natural contingencies which were in place before the intervention resume, resulting in weight loss.

The length of time these studies reported tracking weight tend to be short-term, with evidence that much of the weight that is lost during these interventions is regained over time (Curioni & Lourenco, 2005; Douketis, Macie, Thabane, & Williamson, 2005). A majority of behavioral and cognitive interventions published have a relatively short follow-up, with the average being no more than a year after the intervention is complete (See review conducted by Shaw, O'Rourke, Del Mar, & Kenardy, 2005). Utilizing a timeframe of a year or less can be uninformative since studies indicate that, while there is an initial decrease in total weight, participants re-gain the weight within two years (Curioni & Lourenco, 2005; Douketis, Macie, Thabane, & Williamson, 2005; Paul-Ebhohimhen & Avenell, 2007). Therefore, scheduling the final data collection period for a year or less may lead to an over-estimation of these programs with regards to their long-term success.

The interventions mentioned above are only effective as long as they are implemented, with benefits quickly lost after the end of the intervention. In addition, it is not feasible to continue many of these interventions long-term. Garner & Wooley (1991) assert that these interventions are inclined to be time and resource intensive, and unable to be maintained over time. Even if an intervention was able to be maintained indefinitely the rate of attrition would result in a very small portion of the population receiving treatment (Paul-Ebhohimhen & Avenell, 2007).

Though not present in the behavioral literature, the cognitive literature has identified another potential reason weight loss interventions have not been effective; the psycho-physiological consequences of weight loss. In other words, weight loss, even if it

is from overweight to a healthy weight, is often accompanied by unpleasant and in some cases detrimental emotional changes. These changes are often not dealt with in weight loss programs even though stress, such as the stress from losing weight, can decrease the ability of an individual to show restraint, subsequently leading to overeating and regaining the weight lost (Haynes, Lee, & Yeomans, 2003; Herman & Polivy, 1975; Lattimore & Caswell, 2004; Schachter, Goldman, & Gordon, 1968).

Additionally, the cognitive literature appears to have a greater number of descriptive or categorical accounts of overweight and obesity. Research tends to focus on measuring the differences between categories of individuals (e.g. restrained versus unrestrained eaters) without a thorough discussion of strategies to address interventions that would be effective at altering the cognitions of the individuals most likely to overeat, or least likely to exercise. Though it is important to understand differences in individuals when addressing weight management interventions, more functionality is needed when the objective is how to successfully implement a weight loss strategy.

In short, the mentioned literature calls for additional interventions to address the obesity epidemic if effective, long-lasting changes are to be seen. There are many strategies to bring about effective change, such as adding components to existing programs, or modifying programs to be more translatable and accessible to audiences. Tate, Wing, & Winett (2001), for example, migrated a weight loss program online, allowing participants to access behavioral therapy for weight loss online. When compared to a control group who were only exposed to internet education on obesity, there was a significant weight loss difference of almost three times the control group.

This is just one example of an additive component to weight loss treatment that can be employed to increase the effect of weight loss programs. One major component that has been utilized successfully in behavior change interventions for weight loss has been goal setting.

### **Goal Setting**

Whereas there was some research conducted haphazardly on goal setting prior to 1968 (Thompson & McEwen, 1958; Locke, 1968) it developed the theoretical structure for goal setting that is still used today. However, different fields within psychology utilize different conceptualizations of goals and goal settings. Each field has a distinct, though not mutually exclusive, explanation for the underlying mechanisms that make goal-setting an effective strategy.

Early work on goal setting, such as the work of Lock and Latham (Latham, Mitchell, & Dossett, 1978; Latham & Yukl, 1975; Locke, Shaw, Saari, & Latham, 1981), as well as others (Lochman, Burch, Curry, & Lampron, 1984; Pritchard, Jones, Roth, Stuebing, & Ekeberg, 1988) identified four main mechanisms which resulted in behavior change through goal setting (see Locke E., 1968, for details). First, the goal is directive; it guides attention toward particular activities and decreases attention to others. Second, goals function to energize behavior. Setting a goal will result in a higher rate of behavior than not setting a goal. Third, goals encourage persistence. Setting a goal will result in an individual engaging in behavior for a longer period of time in relation to the goal set. Fourth, goals indirectly result in additional “task-relevant knowledge and strategies.”

Locke argued against earlier theories of goal setting and motivation such as McClelland, Atkinson, Clark, & Lowell (1953), citing the impossibility of measuring the subject matter of “internal motives” and other unconscious forces since these theories are based largely on assumptions of cognitive intention where goal setting is not directly observable and, therefore, not measurable. Locke himself recognized the assumptions made when discussing goals with others in his own model. He suggested that measuring the goals of an individual must be indirectly measured by 1) giving an individual an assigned goal with an overt agreement to accept the goal, 2) giving an individual a choice of goals where they must choose one overtly, and 3) having an individual identify his or her own goals and overtly communicate them vocally or in writing. And even then, it has been shown that goals can fail when individuals are not committed to them (Erez & Zidon, 1984), with “commitment” only being measurable by virtue of the success of the goal-setting procedure or not.

Behavioral psychology has an alternate view on goals, based on objectively observed effects and eschewing the internal assumptions that previous goal-setting theory had supposed. That is not to say that a behavioral account denies unobservable events, but behavioral theory does not treat an unobservable event as an independent variable. As such, many of the suppositions mentioned above cannot be tested and are, therefore, unexaminable. The behavioral account provides a goal setting contingency with four main components; an establishing operation (EO), a discriminative stimulus, the target behavior directed by the goal and the consequence (Huber, 1985).



It has been argued that goals can function as an EO since they can alter the value of a reinforcement stimuli (Agnew, 1998; Michael, 1993). However, EOs typically are conceptualized as having both an establishing and an evocative effect (Michael, 1993). It can be suggested that overarching life goals may act as both an establishing effect, altering the reinforcing value of goal attainment, and as an evocative effect, increasing the likelihood of behavior toward goal achievement.

Goals can also be discussed as discriminative stimuli. Fellner & Sulzer-Azaroff (1984) propose that a goal can act as a discriminative stimulus when it is frequently paired with a reinforced response. It is possible that this frequent accompaniment can result in an increase of the probability of “goal seeking” behavior. In other words, if a goal or statement of a goal precedes or concurrently occurs with a response that is also reinforced, the goal or goal statement will become a stimulus signaling the availability of reinforcement. It should be noted that this depends on the learning history of the individual. If goals have not successfully been achieved in the past, a goal or goal statement may not be a discriminative stimulus. A learning history of successfully achieving goals will be required for goals or goal statements to act as discriminative stimuli (Fellner & Sulzer-Azaroff, 1985). Malott (1992) adds to Fellner and Sulzer-Azaroff, agreeing that some rules function as discriminative stimuli and suggesting that rules influence behavior because it, “might function as a conditioned establishing operation that establishes noncompliance with the rule as a learned aversive condition” (Malott, 2001).

Similarly, goals can also be considered conditioned reinforcers (Fellner & Sulzer-Azaroff, 1984). If goal success is repeatedly correlated with goals, then the goal achievement itself may function as a reinforcer. This conditioning requires frequent pairing of reinforcement with goal achievement; if there is no reinforcement for goal achievement in the presence of the stated goal, it will not act as a conditioned reinforcer.

It has also been proposed that goals can be considered a special kind of rule. Rules, which can be argued to qualify as goal statements, were first introduced by Skinner (1969) in his discussion of rule-governed behavior. He designed rules as contingency specifying stimuli (CSS), stimuli which evoke desired behavior of an individual based on reinforcement history with rule-following, instead of direct acting contingencies. In other words, an individual would follow a rule (e.g. increase your rate of exercise) based on following *other* rules (e.g. taking prescription drugs, driving the speed limit), even though the environmental contingencies for the rule (e.g. losing weight, feeling healthier) have yet to be contacted by the individual. The probability of the individual following the rule is somewhat contingent on the person communicating the rule, either verbally or through writing (Galizio, 1979; Skinner, 1969; Skinner, 1974). It is possible that the function of a goal statement is influenced by rule-governance, since the instructional control over the behavior can be better managed due to the goal behavior not needing independent shaping.

This account of the effectiveness of goal setting does little to address the longitudinal aspects of many goals and rules, which are often deferred or unsubstantiated until much later. Malott (1992) differentiated between two types of natural contingency;

effective and ineffective. He suggested that effective contingencies are successful in shaping behavior because their effects are direct-acting and immediate or close to immediate. Ineffective contingencies are often unsuccessful at shaping behavior because the outcome is delayed and/or unlikely to be directly reinforced. Malott proposes that rules can allow for self-generated statements about contingencies that can lengthen the latency of reinforcement with the successful maintenance of behavior in the absence of reinforcement for a long period of time.

Building on previous behavioral theories Relational Frame Theory (RFT; Hayes, Barnes-Holmes, & Roche, 2001) provides an elaborated account of language and cognition. It is centered around derived stimulus relations that explain the productive quality of verbal behavior, namely with predictable yet untrained relations. These relations are not directly trained per se, but occur naturally when other relations are trained in particular context, similar to stimulus equivalence (Sidman & Tailby 1982). The relations include opposition, difference, before/after, etc. The relations can be arbitrary such as signs and symbols, or non-arbitrary such as physical or temporal, but these connections create the functional foundation for verbal behavior.

With this basis of derived relations, RFT can provide an elaborate theory of goal setting (O'Hora & Maglieri, 2006) that builds on the behavioral theory of goal setting in that when an individual makes a goal statement it functions as a rule, though RFT would say that the goal statement functions as a relational network. It is argued in Hayes & Hayes (1989) that rule governance associated with goal setting may be attributed to an individual's response to a network of derived relations between the goal statement and

external stimuli. In other words, the goal statement transforms the function of other environmental stimuli so that when an individual comes into contact with it, particular behaviors are controlled by it. These effects are altered by the level of performance required by the goal, utilizing arbitrary relations such as less than or more than to allow for derived reinforcement of goal directed behavior (O'Hora & Maglieri, 2006).

Zettle & Hayes (1982) added to the behavioral account of language and rule-governed behavior, analyzing the kinds of maintenance contingencies for the listener. According to Zettle and Hayes, these contingencies are tracking, pliance and augmenting. Tracking is behavior which is controlled by the goal and the external environment, pliance is rule-governed behavior controlled by speaker-mediated consequences, and augmenting is rule-governed behavior that alters the capacity of events or stimuli to function as reinforcers or punishers. An additional breakdown of augmentals is suggested by (Hayes, Zettle, & Rosenfarb, 1989), arguing that goal setting can be a particular type of rule called a motivative augmental. The motivative augmental can increase the probability of a response to a particular environmental event which has already been augmented, resulting in behavior that results in goal achievement.

One example of a goal setting intervention that has been successful in weight loss research is Wing and Epstein, (1981). Wing and colleagues randomly assigned individuals to one of three groups; the small restriction group which decreased their food intake by 200 calories a week until reaching 1000 calories and maintain over five weeks, the moderate restriction group which was asked to reduce their food intake by 1000 calories immediately and maintain for 10 weeks, and the large restriction group which

was asked to reduce their intake by 1500 for three weeks, then decrease to 1000 a day deficit for two weeks and then maintain for five weeks.. Participants were called three times during the week initially, in order to determine progress and to see if participants had questions. In addition, they were provided with goal sheets to monitor their calorie intake. Results demonstrated that all groups lost significant weight over time, with very little difference seen between each group, despite the differences between caloric consumption. However, results indicated that one group, the medium consumers, had the highest rate of compliance.

As aforementioned, goal setting alone may not be enough to successfully address weight loss. It has even been suggested that goal setting alone may actually decrease weight loss effectiveness, possibly increasing frustration of patients if their goal cannot be met, or increasing the probability of relapse by generating a focus on vanity and not overall health and wellbeing (Foreyt & Goodrick, 1993). Others give another interpretation, stating that patients may have unreasonably high expectations, set their goal too high and become demoralized (Cooper & Fairburn, 2001; Linde, Jeffery, Finch, Ng, & Rothman, 2004). It is also possible that patients may underestimate the significance of whatever weight loss they have achieved, discounting the benefits such as better health outcomes, greater fitness, or aesthetic changes and focus on the weight they have yet to lose. Lastly, patients might set long term goals but fail to set short and medium term goals to bridge the timespan. Setting a goal that is attainable but not quickly achievable may lead to decreased motivation or distraction because of the delayed nature of long-term achievement.

In short, it would be important to consider additional factors in an intervention targeting goal setting in order to ameliorate these potential negative outcomes. Ideally, another variable would attempt to cover both the possible disadvantages of goal setting alone, as well as the disadvantages with current weight loss interventions. The most beneficial addition to a goal setting intervention would address the lack of longitudinal effectiveness and the discomfort associated with weight loss suggested in the literature. One area of psychological interventions that have demonstrated long term impact associated with goal setting is Acceptance Commitment Therapy.

### **Acceptance Commitment Therapy**

Acceptance Commitment Therapy (ACT) is derived from the work of RFT (described above), is based in the philosophy of functional contextualism (Biglan & Hayes, 1996; Hayes S. , 1993), and has successfully been implemented in impressively broad array of settings. These interventions include work in the areas of stress, pain, smoking, anxiety, depression, diabetes management, substance use, stigma, cancer and the life adjustments associated with diagnosis, epilepsy, psychosis, and personality disorders (see review by Hayes, Luoma, Bond, Masuda, & Lillis, 2006).

ACT consists of six core processes: contact with the present moment, values, committed action, self as context, defusion and acceptance which can be organized into acceptance and mindfulness processes (acceptance, values, the present moment, defusion) or commitment and behavior change processes (committed, action, values, and self) (Hayes, Levin, Plumb-Villardaga, Villattee, & Pistorello, 2013). These processes are

considered psychological skills meant to be trained and developed, and they all combinatorially interact to promote psychological flexibility.

Moreover, ACT interventions have previously been used to treat obesity and obesity related issues. For example, a study conducted by Forman, Butryn, Hoffman, & Herbert (2009) examined the effectiveness of the incorporation of ACT into a 12-week innovative behavioral weight control program workshops. The class itself was based on the LEARN model (Brownell, 1997) however, the cognitively based strategies typically utilized (e.g. cognitive restructuring, interrupting chains of cognition) were omitted and replaced by ACT based interventions such as distress tolerance, mindfulness and commitment enhancement. Participants were selected from employees at an urban university and screened by phone and then in person to ensure eligibility. The methodology utilized a single-group design, with a pre-assessment, post-assessment and then another post-assessment 6 months later. Participants' weight was measured, as well as treatment dose, quality of life, treatment acceptability and other surveys assessing things such as mindful awareness. The results suggest that the intervention was successful, with an average of 6.6% weight loss at the first post-assessment and 9.6% weight loss at the 6-month follow-up, with a dramatic increase of reported quality of life. No additional follow-up was reported, so it is possible that the weight was regained after the 6-month assessment. However, the pattern reported is inconsistent with the literature on weight regain. It is not typical for participants to lose additional weight after the intervention is complete, as is reported here; typically, a small amount of weight is regained at 6 months to a year, with the full amount being regained after about two years.

It is, therefore, hopeful that ACT can provide long-lasting treatment which continues in its effectiveness once the intervention is removed.

ACT interventions have already been conducted as a one-time, additive component of an obesity treatment, with results that suggest the intervention successfully supported weight loss. Lillis, Hayes, Bunting, & Masuda (2009) randomly assigned patients who had participated in at least 6 months of a weight loss program in the last two years to either an ACT group or a wait-list control group. For the ACT group, the authors administered a one day, ACT based workshop. The workshop focused on acceptance, mindfulness and values of ACT in regards to weight, stigma of overweight and obesity, and the control or management of weight. Each participant also completed a number of psychological batteries measuring quality of life, psychological distress, psychological flexibility and stigma in addition to measuring weight and BMI. A three-month follow-up demonstrated that those in the ACT group had larger effects of psychological flexibility, stigma reduction, improved quality of life scores and valued action in terms of barriers to weight loss. In addition, the ACT group lost more weight than the control, though the authors admit that such a short follow-up period is not ideal with variables that take so long to change, such as weight loss.

ACT has also been used to successfully promote physical activity in college women. Butryn, Forman, Hoffman, Shaw, & Juarascio (2011) randomly assigned a group of 54 women, ages 18-35, to either an ACT or Education condition. Each condition required participants to attend two, 2-hour group sessions which occurred two weeks apart. The participants in the education condition were provided with information about



safely engaging in physical activity and learning how to incorporate safe practices into their workouts. The participants in the ACT condition were taught to develop willingness skills, diffuse themselves from stressful thinking while exercising and strengthen their exercise related values. The experiment analyzed the differences between the two groups in terms of number of visits to the college athletic center and a number of surveys such as the mindful awareness, diffusion from negative internal experiences, and physical activity experiential acceptance. Though the sample size was small, a statistically significant difference was found between the two groups in terms of athletic center visits during post-test and follow-up 8 weeks after the intervention. Though there was a decrease in the number of center visits for the ACT group between their post-test and follow-up, the frequency of visits was still significantly higher than those in the Education group. While this is just a pilot over a short duration, it demonstrates immediate effectiveness of ACT interventions, with only a few weeks between the intervention implementation and the post-test. It also depicts that a brief ACT intervention can have a longitudinal effect on exercise behavior.

Though ACT studies have been published since the 1980s, those specific to organizational settings have come about in the past decade and tend to be referred to as ACTraining due to differing populations and techniques (Bond, Hayes, & Barnes-Holmes, 2006; Hayes, Bunting, Herbst, Bond, & Barnes-Holmes, 2006). Research with ACTraining has demonstrated effectiveness with the use of exercises that target values clarification, mindfulness, cognitive flexibility and perspective taking. To date, ACTraining studies have improved mental health and innovation (Bond & Bunce, 2000) reduced stigma, stress, and burnout (Brinkborg, Michanek, Hesser, & Berglund, 2011;

Hayes, Masuda, Bissett, & Guerrero, 2004), call center performance (Bond & Flaxman, 2006), absenteeism (Bond, Flaxman, & Bunce, 2008), and college performance (Chase, et al., 2013).

Unfortunately, there have been no studies of ACT values alone in the weight loss and weight management literature. However, experiments which examine individual components of ACT in the same contexts have been encouraged in the literature. These small, component analysis studies are referred to as micro-studies by Hayes, Luoma, Bond, Masuda, & Lillis (2006). It is, then, imperative that studies be conducted with other pieces of ACT in similar settings to determine the effectiveness of the components of ACT.

### **Values**

As discussed above, one of the key components of ACT is the concept of values. Values are, “chosen qualities of purposive action that can never be obtained as an object but can be instantiated moment by moment,” (Hayes, Masuda, Bissett, & Guerrero, 2004; Hayes, Levin, Plumb-Villardaga, Villattee, & Pistorello, 2013). From a behavior analytic perspective, values can be described as “verbally, construed, global, desired life consequences” (Hayes, Strosahl, & Wilson, 1999) or, “qualities intrinsic to action that can be instantiated but not obtained or finished” (Chase, et al., 2013). Research into the use of values interventions specifically have had less attention than ACT interventions in the weight management literature, though ACT interventions often include values as one part of the intervention. In essence, values refer to a person’s belief regarding the importance of their health (e.g. eating healthy foods, engaging in physical activity, etc.)

or how they will utilize their healthy capabilities. Most often they are incorporated as values clarification exercises, though there are numerous methods that have been developed (Wilson & Dufrene, 2009). These exercises assist an individual to identify life directions in various personal domains and differentiate between chosen values and values imposed on a person. These exercises also encourage values that are not chosen based on avoidance, fusion or social compliance, but by the individual him or herself.

The underlying principles of ACT and values posits that a value predicts an individual's behavior since individuals often show minimal awareness to activities they do not value (Houmanfar & Ward, 2012; Schunk, 2003). Conversely, values are assumed to aid in increasing the likelihood of behavior that is in accordance with one's values, even if sometimes the behavior or situation is aversive to the individual (Wilson & Murrell, 2004). In short, values can help alter the negative stimuli from something to be avoided to something to be dealt with as part of an overarching life goal.

It is worthwhile to mention that, while goals and values are interrelated, they are distinct from one another. Values are abstract, instantiable and always present, while goals concrete and are able to be achieved (Hayes, Levin, Plumb-Villardaga, Villattee, & Pistorello, 2013; Ward, Houmanfar, & Chase, 2013; Houmanfar & Ward, 2012). Values, "cannot be fully satisfied, permanently achieved, or held like an object. They tend to be relevant over very long time frames, in many situations, and are less subject to satiation and change" (Hayes, Strosahl, & Wilson, 1999). Values are not behaviors themselves, but values do help guide choices to engage in behavior in line with one's values.

So it stands to reason that individuals clarifying their values will decrease the likelihood that they engage in unvalued activities. It is also predicted that action is more probable when the individual believes that their behaviors will result in positive outcomes, especially when the outcomes of the behaviors are valued. This leads to the prediction that individuals who clarify their health values will be more likely to engage in behavior that is in line with those values.

The process of clarifying one's values modifies how that person interacts with environmental events such as adversity invigorates and encourages individuals to engage in behavior that serve their stated values. The exercise of values clarification often results in altering the function of tasks, making unpleasant tasks more likely to be completed if they are in service of an individual's stated value. This is evidenced by many values based interventions which have resulted in increases of quality of life and participation of activities that serve the stated value (see Hayes, Masuda, Bissett, & Guerrero, 2004).

Values have often been integrated into an ACT intervention but rarely have they been implemented as stand-alone interventions or additions to non-ACT interventions. There have been some studies conducted in pain tolerance (Gutierrez, Luciano, Rodriquez, & Fink, 2004; McCracken & Yang, 2006; Paez-Blarrina, et al., 2008; Vowles & McCracken, 2008), school performance for minority students (Cohen, Garcia, Apfel, & Master, 2006), psychological distress (Creswell, et al., 2005) and health messages (Harris & Napper, 2005) with values clarification only, but not in combination with a goal setting intervention, and there is no literature where this was conducted in weight

management. However, there was a study recently conducted in the area of student retention and performance.

A recent example of an intervention examining the effects of goal-setting and values clarification exercises to address an important issue that has historically been difficult to solve is Chase et al. (2013). Chase and colleagues implemented an online goal setting and values clarification exercise with undergraduate psychology majors and measured academic variables such as GPA and drop-out rates. Students were randomly assigned to one of three groups; goal setting only, goal setting plus values clarification or to a waitlist to receive goal setting and values clarification the following semester. In addition, anonymous institutional data were collected from students who did not participate but were undergraduate psychology majors at the same school as a non-equivalent control group.

Students completed their assigned module(s) within the period of one month, answering questions regarding their education goals and, if they were assigned to the goal setting plus values clarification group, were asked to identify their academic values. All modules were presented as audio-visual presentations with intermittent questions and responses required from the participants. The goal setting module consisted of didactic information regarding the importance of academic goal setting, as well as how to set academic goals. The values module consisted of didactic information on values from an ACT perspective and a portion where the participant identified their own academic values. Tools were provided for participants to monitor goal completion (for the goal-

setting only group) or goal completion and values success (for the goal setting plus values clarification group) though there was not a requirement for participants to use them.

Data was collected during three time periods; pre, post and follow-up. The difference between the primary variable, GPA, was statistically significant between pre and post when the three groups were compared, with the values clarification plus goal setting group significantly higher than the goal setting only group and the waitlist group. During follow-up, the goal setting plus value clarification group decreased in GPA, but the reduction was not significant for either the group itself (it was not statistically significant within group when compared to the previous semester) or when compared to the goal setting alone group (GPA was still higher in comparison). Additionally, the waitlist group received the goal setting plus values clarification modules between the post and follow-up periods. There was a substantial increase in GPA approximately equivalent to the effect seen in the initial group that received both modules. And all interventions resulted in higher GPAs than the non-equivalent responders, though the goal setting group did not demonstrate statistically significant difference with the non-equivalent responders.

Chase, et. al. provides a useful mode of administration with the development of an online training package. There are few studies which use the same online format to deliver behavioral interventions. More research is needed to determine the utility of these modules in other settings, with diverse populations, and to determine the additive effect of values on goal setting for other behaviors. It is also important that these components

be implemented in additional settings with additional populations to determine the ability to generalize.

### **Purpose**

The preceding indicates that while overweight and obesity are prevalent health issues with considerable and long-lasting effects, the methods used to address weight-loss and weight management are not adequate to solve the growing issue. This inability to curb the obesity epidemic has long-ranging and detrimental effects to the nation. All of society benefits from increasing the effectiveness of existing weight management programs; from increases in quality of life and health for individuals, to a decrease in healthcare utilization in medical systems and reduced morbidity and mortality in the national population. Inadequate methods, or methods that only temporarily decrease an individual's weight are detrimental in that they do not adequately remedy the issue but do utilize time, effort and resources which could be better used on effective methods. Thus, it is imperative that more efficient and adequate ways to improve weight loss and weight management strategies be researched and implemented. The current research combines a number of innovations in weight management and to address some of the shortcomings identified in the literature thus far.

Firstly, the use of the internet to deliver health-based interventions has been successfully utilized many times previously and in some cases delivered exclusively over the web. An intervention (Tate, Wing, & Winett, 2001) examined the success of a web-based behavioral weight loss program with the success of a weight loss program that was education based. Both programs were successful in reducing the weight of the

participants. However, the behavioral program was more successful, with a greater amount of weight loss, a higher percentage of participants losing 5% or more of their original weight with twice as many achieving this benchmark compared to the education group, and persistence with the weight loss during the maintenance phase. In addition, both programs were successful in retaining participation, with attrition rates at about 15% after three months; lower than is typically seen in similar weight loss programs which were not web-based (Abrams & Follick, 1983; Stunkard & Brownell, 1980). Results such as these, and results from other similar studies (Booth, Nowson, & Matters, 2008; Taylor, Agras, Losch, Pante, & Burnett, 1991) support the addition of web-based interventions to existing programs, demonstrating that online content can be beneficial to weight loss and weight management.

Second, it is much more efficient to utilize methods which have been proven effective and develop ways to “turbo-charge” them with small modifications which are efficient, easy to administer and enhance the long lasting positive outcome (Forman, Butryn, Hoffman, & Herbert, 2009). One possible way to attach an intervention to an already successful weight management program is to add a goal-setting and values clarification intervention. A minor adjustment could increase the program’s success rate, providing the benefits already mentioned, without expending time and effort that would be required to develop a completely new program. By pairing with existing programs, interventions do not need to develop infrastructure, delivery plans and data collection methods- these things are already in place within the existing program. This further increases the cost-effectiveness and decreases the latency of positive outcomes by being able to implement the intervention more quickly. It also is beneficial to implement a



scalable intervention by providing it online. An electronic administration can easily be administered to a large audience if proven to be effective.

Third, Jeffery, et al. (2000) have advocated for innovative research that integrates components which promote long-term weight management. They argue that the current strategies for weight management are successful, as demonstrated by the initial weight loss, but that the typical weight regain after the intervention is evidence of a “deterioration in adherence” to the new, healthier behavior learned through the intervention. They support adding components to weight management interventions that teach “maintenance-specific skills,” or behaviors which decrease the likelihood that the behavior of the patient will relapse to what was typically seen before the weight management intervention. Though not discussed specifically, the authors are acknowledging that the contingencies in place during a weight management intervention are not perpetuated after the intervention is complete; when those contingencies are removed eating and exercise behavior, understandably, returns to previous levels. Thus, they support the development of additional program components to encourage the maintenance of healthy behaviors after implementation. However, initial attempts at follow-up strategies have not been successful (Wing, et al., 1996), necessitating further research into possible additive components to extend the success of weight management interventions.

Fourth, Sheldon and colleagues (Sheldon & Elliot, 1999; Sheldon & Houser-Marko, 2001) argue for the additive benefit of basing goals on values and personal interest, demonstrating that goals based on values are more successful. One possible

component is the addition of a goals setting and values clarification to existing weight management strategies to align goals with personally held values. Sheldon and colleagues have stated that failure to obtain stated goals is that the goal setting process lacked planning for goal attainment. However, they do not suggest strategies to increase the likelihood of success. It is possible that the addition of a values clarification component to the goal setting component could act as a guide for those attempting to achieve a particular goal. The values exercises may help guide goal setting, ensuring that the goals set are in line with a person's values. This is supported by the study conducted by Chase et. al. (2013) which demonstrated an increase in student performance with the combined components of goal setting and values clarification.

Fifth, it is reasonable to suggest that the overweight or obese find it difficult to lose weight because it necessitates the tolerance of unpleasant states of discomfort (hunger, deprivation, etc.) and possibly the addition of strenuous, uncomfortable activity (Byrne, Cooper, & Fairburn, 2003; Goodrick & Foreyt, 1991; Kearney, Rosal, Ockene, & Churchill, 2002). This may also play a role in the long-term ineffectiveness of most weight loss programs; once the program is discontinued the unpleasantness of the discomfort that comes along with dieting and exercise is no longer incentivized so that eating and exercise behavior return to normal, comfortable levels. In essence, the levels of positive reinforcement which were artificially added to the environment during the intervention are removed and the negatively reinforced behavior of eating and relaxing increase in frequency. It is, therefore, also proposed that the values-clarification component may affect individuals by increasing the ability to cope with aversive stimuli such as hunger, or physical exertion while concurrently increasing the likelihood that

they will behave in a way consistent with their goals and values (Byrne, Cooper, & Fairburn, 2003; Forman, Butryn, Hoffman, & Herbert, 2009; Forman & Herbert, 2009; Hayes, Strosahl, & Wilson, 1999; Kearney, Rosal, Ockene, & Churchill, 2002).

In short, this study has addressed some of the abovementioned issues identified in the overweight and obesity literature using online modules and materials targeting goal setting and values clarification with patients enrolled in a weight management program. The aim of this study was to assess the additive effects of online values clarification and online goal setting procedures on measures of a) weight management and b) behavior change of individuals in a weight management program, with an emphasis on changes to levels of physical activity.

### **Health Management Resource (HMR) Program**

The University of Nevada School of Medicine's (UNSOM) Health Management Resources (HMR) program operates under the auspices of the Department of Internal Medicine and is a nation-wide weight management program with a proven track record of successfully helping individuals with weight management. The HMR program integrates a number of components; meal replacement, eating and exercise tracking, group support and support from trained dietitians. It is heavily supported by published research, with statistically and clinically significant results for weight loss (Anderson & Furlow, 2008; Anderson, Grant, Gotthelf, & Stifler, 2007; Smith, Walleggen, Gotthelf, Cook-Weins, & Donnelly, 2007), behavior change (Gotthelf & Grant, 2006), and a decrease in risk factors (Anderson, Conley, & Nicholas, 2007; Gotthelf & Grant, 2005; Grant & Gotthelf, 2007; May, Grant, & Gotthelf, 2006).

There are two phases to the HMR program. The first phase (Phase 1) takes 12 weeks to complete. HMR requires that, during the 12 weeks of Phase 1, patients attend a weekly support class which consists of between 5 and 20 other HMR patients, as well as a trained dietician. The dietician leads the group through a series of lessons produced by HMR. These lessons are standardized across the nation; with a relatively strict script the dietician must adhere to for treatment integrity. Each lesson includes educative and support components which are also highly standardized.

Phase 2 of the HMR program is similar to Phase 1 except there is a lessening of restrictions to the diet. Phase 2 can continue indefinitely. Conversely, patients can complete Phase 1 again at any time, or drop out of HMR if they desire. The current research will only focus on Phase 1 at this time but due to the longitudinal nature of the HMR program, and the institutionalization of the data collection, it is possible to conduct long term follow up with patients who continue into Phase 2.

There is a “goal setting” component to the HMR program, requiring minimums for each main area of HMR called “imperatives”. These imperatives include proper nutrition to ensure patients are consuming the appropriate amount of calories, vitamins and minerals, as well as behavioral goals. These imperatives are set for meal replacement, staying “In the Box,” consumption of fruits and vegetables, a set amount of physical activity, and a “triple” imperative. The meal replacement imperative requires a specific consumption of three main categories of HMR food; entrees, bars or cereals, and shakes. Entrees are boxed, vacuum sealed meal dishes such as lasagna or turkey chili. Patients must consume at least three entrees per day. In addition, patients must consume at least

two shakes per day. Shakes must consist of at least a measured amount of HMR shake powder and any non-calorie liquid. They may also contain additional ingredients such as fruits or HMR pudding mix. Patients are also required to have at least 5 cups of fruits or vegetables per day. Physical activity is also set as a minimum, in terms of number of calories burned. If patients meet these three imperatives, they meet the “triple” imperative. The number of bars and cereals consumed are tracked, but they are not calculated in any imperative. Patients are allowed to consume as much as they want as long as what they are consuming is within the HMR program. Patients will still achieve the imperatives if they consume more than the aforementioned amounts of each item; these are minimums that must be reached, not maximums.

HMR mainly focuses on *appropriate* behavior for patients. However, there is also an imperative which tracks *problematic* behavior; HMR has created a concept of “staying in the box,” or following the HMR prescribed program. Patients who engage in behavior not included in the program are considered out of compliance with the HMR program. This essentially means that patients have eaten food which is not part of the programmed diet for HMR. Note that a patient can consume an item not approved by the HMR program but still achieve the triple imperative. It is an important distinction to consider during data analysis since it demonstrates noncompliance with the program and could alter other variables, specifically the rate of weight loss.

Lastly, there is an imperative for physical activity. A set goal of calories burned while participating in physical activity outside the normal activity a patient would normally engage. This includes any activity required by the patient’s job or activities that

are already part of the patient's routine. The number of calories burned are aggregated by week, with patients encouraged to spread it out over each day.

While not considered imperatives, data is also recorded on patient participation in the weekly group meeting and weekly one-on-one phone call with a dietician. These are two important components to the program, with the group meeting including a public posting of the patient's results, and the phone call including reporting mid-week progress. Each are required in order to participate in the program, though each can be made up if the patient is absent from either.

It is worthwhile to note that there is limited training on goal-setting, setting personal goals or what constitutes good goal setting in the HMR curriculum. The goals that are set are essentially minimums determined by HMR research to be sufficient for effective weight loss. The success of these goals are discussed below, but it is permissible to state that they do not act in the same way as the goals which will be part of the intervention. Additionally, the goals which are already included in the HMR program are considered "treatment as usual" for the current research, as they will be administered to all participants equally. Of interest will be the success of the goal setting already in place when participants in the experimental group are exposed to a more comprehensive and personalized goal-setting module.

## **Method**

### **Experimental Design**

A randomized between group design with a control group was used, with additional analyses conducted within group as well. The experimental group received an online values-clarification and goal-setting training module during the course of their HMR program. The experimental group was compared against a control group with approximately the same number of participants (Experimental Group n=21, Control Group n=20). The control group received a neutral module detailing how to make smart food choices during Phase 2 of the HMR program. It is important to note that the content presented to the control group was inactive, meaning that they could not interact with the content they learned until after Phase 1 was complete. This is because the content in the control module had to do with food choices external to the HMR Phase 1 program. Since Phase 1 did not allow any external food to be consumed, the control group was not able to utilize the knowledge they gained from the control module to alter their HMR experience in any way.

### **Participants and Setting**

Participants were recruited from cohorts which participated in Phase 1 of the HMR program. The HMR office begins new groups each week, inducting new cohorts during one of three days per week. These cohorts will be targeted for this research, with the intent to continue data collection and intervention for additional groups in later months with the permission of the director of HMR at the completion of this study in order to further assess effectiveness for a larger population. This will be done mainly

because the maximum number of patients per cohort is restricted so not to overwhelm the staff and to ensure quality services are provided by the clinic.

Each patient who agreed to participate was randomly assigned to either the experimental or control group. This assignment happened during each week so that each cohort will have approximately the same number of experimental and control participants. In some cases, the cohort was too small to have an approximately equal number assigned to each group (e.g. there was only one person in the cohort), though random assignment still took place for that single participant. All participants were told that they were not allowed to discuss their group assignment with others. In addition, they were asked not to share the content of their modules with others in their HMR class, to prevent cross-contamination of the intervention's effect. In the rare case that patients were married and agreed to participate, they were paired together during random assignment. This was to protect against the potential of cross-contamination, which is much more likely in married partners.

The HMR weight management program is run out of the Office of Internal Medicine within the University of Nevada, Reno School of Medicine. The main offices are located in the Center for Molecular Medicine building on campus. The weekly courses are conducted in that building as well, with the meeting day and time specific to each cohort. Group meetings are conducted in a large room able to accommodate up to twenty people, and the dietician. The room is equipped with a white board to illustrate important points the group will or have gone over, as well as reminder posters regarding food that the patients are allowed to eat, what they aren't allowed to eat, etc. There are



also motivational posters encouraging various healthy behaviors and a portable easel for the dietician to use to write or illustrate important points. The dieticians have offices on the second floor, which are separate from the meeting room. The offices are housed in a medical setting, allowing the dieticians to conduct assessments of potential HMR patients before they enroll in the program. These offices are also where the one-on-one calls are conducted half way through the week via telephone.

It is worthwhile to note that during the current experiment HMR was purchased by a large pharmaceutical company. While this didn't explicitly alter the delivery, curriculum or any other aspect of the HMR content, it did result in some organizational change for HMR. This included a delayed process for research approval for the present study. In addition, the Reno HMR office experienced a high number of turn-over during the study, with 100% of their employees (with the exception of the HMR Director) being replaced. The HMR curriculum is very structured and factors out many different idiosyncratic variables that might have a large effect on outcomes. However, it is important to note the turnover since it is possible the many changes had an impact on patient outcomes as well as the results of the current line of research.

The modules for both the experimental and control groups were completed online, and as such, can be done anywhere convenient for the participant. There were no restrictions to the locations participants use, but they were told that they need an internet connection with a connection fast enough for audio-video and should be done in a quiet place where they can concentrate for approximately one hour.

### **Compensation**

Participants were not compensated for their participation. Initially, compensation was discussed, but due to logistical constraints, it was determined that participant compensation was not feasible. This mainly had to do with the continuous on-boarding of new participants. There were three potential times that participants could enroll in each week. This staggered the number of participants who were agreeing to participate into one week blocks. There were oftentimes weeks in which only one patient agreed to participate. It became too difficult to track a large number of participants over their time at HMR since some did not complete all 12 weeks, some continued on after 12, and some did not even finish Phase 1. Logistically it was too haphazard to create groups with which to present compensation via a raffle or lottery and still ensure that the winning participants were present at HMR when they won. It was decided to forego the compensation. This was supported by the reports from the director of HMR who provided historical anecdotal evidence of the HMR population being very open and accommodating to participating in research. This was validated based on the number of patients who agreed to participate in the current research.

### **Demographic Characteristics**

The demographics for each group was comparable. No notable differences were observed between the experimental and control groups. Each cohort was comprised of approximately 80% females. The experimental group contained 17/21 females, equivalent to 80.1%, while the control group was comprised of 16/20 females, equivalent to 80%.

### **Procedure: Part I**

**Pre-Assessment Batteries.** Part I of this intervention (the pre-assessment batteries) was implemented before the video module interventions. It occurred during the orientation and induction which all new patients must complete when they join the HMR program. The four assessment batteries presented in Part I were the Depression, Anxiety and Stress Scale (DASS), the Acceptance and Action Questionnaire (AAQ), the Short Form Quality of Life Survey (SF-36), and the Social Support Appraisal scale (SS-A; see Appendices A, B, C and D). Participants responded to the assessments in writing, indicating their answer to each question using a Likert scale multiple choice answer items, which vary in response options depending on the assessment. Once the participants completed the batteries they returned them to the HMR staff, who set them aside for a member of the research team to score. Their scores were not communicated back to them.

Informed consent was not required for Part I, as the assessment batteries were integrated into the HMR onboarding practice. An information sheet was provided to each participant, and HMR staff were trained to present the batteries and answer questions patients would have. Patients were asked to fill out the batteries as a part of the HMR onboarding. However, because participation was tied to the HMR file and not the participant data for the current research, there were fewer participants who filled out the batteries prior to their involvement with HMR. This is because patients entering the HMR program have the right to refuse any of the tests or procedures that HMR requests they complete. In order to encourage patients to complete Part I, HMR staff were instructed to have patients fill out the batteries while the patient was waiting in the lobby of HMR before meeting with the dieticians.

The batteries and their results are considered part of the patient's charts. The biomedical IRB at UNR has approved access to this information, as well as other important, non-HIPPA protected information. Since the batteries were considered part of the patient's chart and were distributed to all patients, regardless of their participation in the research, a number of patients completed the batteries but did not participate, or were excluded from the research. Their data are still considered part of the patient file, though their file was not accessed for the of this study.

### **Procedure: Part II**

**General overview of the training modules.** As stated previously, Part I of this study was not required for participation in Part II, and participation in Part I did not guarantee that participants would be included in Part II. All patients were approached for consent after their third week of the HMR program, since all were potential participants even if they had not completed Part I of the study. This was mainly to ensure two things. First, that participants understand the intervention clearly, since participation in Part I did not explicitly discuss the potential to participate in Part II. It also allowed a member of the research team (as opposed to a member of the HMR staff) the opportunity to contact the potential participant. Members of the research team were more familiar with the research, could answer any questions about the research in more detail and provided a non-partisan individual who would not exert any potentially coercive pressure that might influence participation.

Second, a separate approach by a member of the research team asking for participation in the research was to decrease the chance that participants were

overwhelmed by all the new changes they were asked to implement. It is for this reason that recruitment took place after the participant's third HMR class. Targeting potential participants after their third HMR class was decided based on feedback from the HMR clinic director, who said that patients tend to feel very overwhelmed on the first day of class since there is a substantial amount of information to learn in a short period of time.

Consent was collected by a member of the research team as soon as the class had ended. The dietician that was leading the class provided the research team with names of all patients who were completing their third class that night. The class leader also asked each of the patients to stay after class. A member of the research team explained the research, the general procedures that would be involved and went over the consent form in detail. The consent form included information on approximate time commitment, potential benefits and dangers, contact information for both the research team and the UNR IRB, as well as other pertinent information for the research.

If the patients consented, the research team-member collected their name, signature as well as contact information from participants in the form of personal emails. Once consent forms are collected, participants were randomly sorted into one of two groups, the experimental group or the control group. Each participant was contacted by email the day after they indicated they would like to participate. They received an email from the Qualtrics, an online survey distribution tool system, which instructed them to complete the modules before their next class. The instructions also included a link to the online modules. The content to the modules depended on the random assignment to the experimental or control group. The modules were administered via Qualtrics, which

allows for audio-video, survey question tracking and participant management.

Reminders were also sent out on the third day after the initial email, as well as the sixth day after the initial email. Reminders were only sent to those who had not completed the modules at those time periods. Qualtrics does not send out reminders to participants who will have already completed the modules.

Each module consists of audio-visual (with a text option available) teaching segments on the relevant content. The content was dependent on the random assignment to the experimental or control group. If a participant was in the experimental group, he or she received a module on goal setting and a module on values clarification. These modules were based on literature in the areas of values clarification and goal setting. Each module segment gave a condensed version of the information for that content.

The control group received a module on an HMR topic of food substitution. HMR has an establish curriculum that is presented near the end of Phase 1 to acclimate patients as they transition into eating other, non-HMR foods. This topic was selected for the control module since the content is taught as part of the HMR curriculum and is therefore less likely to confound the results by providing new or novel information to the control group. It was also selected because the content of the module was inactive, since the lessons learned from the substitution curriculum could not be used until Phase 2 because during Phase 1 patients are not allowed to eat any kind of food except the food HMR provided.

In addition, the modules for both the experimental and control groups required participants to answer a question for major chunk or segment of content. This was to

ensure that a) the participant was paying attention and b) to determine how well participant understood the content. The scores on the segments were scored and provide a behavioral way to measure understanding and determine if it had any moderating effect on the independent measures. Participants were required to answer the questions before continuing, to prevent individuals from skipping questions to get through each segment. The question required an answer, though a participant was still allowed to move forward if they get the question wrong. Qualtrics does not allow for feedback or requiring a correct answer, however the accuracy of each participant was tracked and compared to their other results.

In addition, each experimental module terminated in a questionnaire and an optional component. The values-clarification training ended with the Personal Values Questionnaire (PVQ; discussed below). The goal-setting training ended with the Personal Goals Questionnaire (PGQ; also discussed below). The optional component was also specific to the previous training, with an optional goal tracking component and values tracking component provided for the experimental group.

**Values clarification module.** The values clarification module included information and basic training on the ACT literature to encourage the participants to begin to identify and define their values and what they find most important. Specifically, participants in the experimental group were taught the basic definitions of values from the ACT perspective, with a brief elaboration on some examples of values via the audio-visual presentation and optional text. The concept of values was also differentiated by instruction about what values are not. Participants then received two ACT metaphors

*(Bringing Health Values into the Present, and Tending the Garden)* followed by the instructions to write about their health values. Though not explicitly stated, the examples provided were all focused on increasing physical activity based on the comments of this dissertation committee's recommendation to focus on physical activity. The values clarification module concluded with the Personal Values Questionnaire (PVQ; Appendix E) and an optional self-management component.

**Optional component.** All participants in the experimental group were provided with an optional "values-clarification calendar" that could be used to monitor their behavioral commitment to their health-based values on a weekly basis. This time period was conducive since the regular HMR meetings were also conducted weekly. Participants were able to print the calendar off to help them track their behavior over the course of the week to determine if they were living in line with their stated health values. The calendar consisted of an MS® Word document where participants could write in their values and document the behaviors they engaged in on a weekly basis which were in line with those values. This may have helped the participants demonstrate, on a weekly basis, what they were doing to live in accordance with their particular value or values. However, this was an optional component and was in no way required on the part of the participant.

**Goal setting module.** The goal setting module provided information on current goal setting literature, including how to set SMART goals (goals that are specific, measurable, actionable, realistic and time-oriented) and the differences between proximal, intermediate, and distal goals. Participants were then walked through setting a



long term goal, an intermediate goal and a proximal goal. Though not explicitly stated, the examples provided for goals were all focused on increasing physical activity based on the comments of this dissertation committee's recommendation to focus on physical activity. Each goal they set was in relation to their long term goal. After these goals were stated, participants were asked to brainstorm potential obstacles to goal achievement and develop contingency plans in the situation that these barriers would occur. They were also asked to think about, and write down, why the goal was important to them and describe the specific action steps they would engage in to attain their stated goals. The goal-setting module concluded with the Personal Goal Questionnaire (PGQ; Appendix F) and an optional self-management component. The experimental group completed the values clarification module before the goal setting module, which is consistent with the literature on the additive effect of values clarification on successful goal setting.

*Optional component.* All participants in the experimental group were provided with an optional "goal-setting calendar" that could be used to monitor their goal-relevant behavior as they worked on their health-based values on a weekly basis. This time period was conducive since the regular HMR meetings were also conducted weekly. Participants were able to print the calendar off to help them map the goals they set over the course of the week to determine if they were living in line with their health goals and to highlight potential problem areas (barriers) that could result in not reaching their goals. The calendar consists of an MS® Word document where participants would write in their goals and document the behaviors they engaged in on a weekly basis which were in line with those goals. This helped the participants demonstrate, on a weekly basis, what they

are doing to achieve their goals. However, this was an optional component and was in no way required on the part of the participant.

**HMR Food Substitution Module.** The food substitution model provided information on the HMR developed “HMR Calorie Guide for Weight Management.” This guide was developed to help HMR patients make better food choices once they are done with the first phase of HMR and are ready to begin introducing outside food into their diet. The guide summarizes what HMR wants patients to know about food calories and how to make substitutions so the food they eat is less calorie dense, or dense in poor calories such as foods high in fats or highly processed foods. The guide is separated into categories of food (e.g. dairy, meats, fruits and vegetables, baked goods, condiments, etc.) and then foods in each category are ranged along the bottom. As foods move from left to right, the amount of calories per serving increases. Foods furthest on the right (10s) are the highest calorie foods and consist of poor food choices.

The curriculum trains patients about how to make healthier food choices without sacrificing the foods they love to eat. Patients are encouraged to choose mainly low numbered foods (or foods on the left end of the chart), only occasionally eating in the higher numbers to the right of the chart. The curriculum also includes strategies for substitutions, such as eating grilled chicken instead of fried chicken, since fried chicken is a high numbered food.

The content of this curriculum, as well as the associated material such as the substitution chart, was modified into an online module in the same format and delivery as the experimental modules on values clarification and goal setting. After learning about

the content, participants were then asked to identify foods which they would normally eat. They were then asked to look at the calorie guide and write down substitutions they would make in order to improve their diet. They were asked to provide a few personal examples of their substitutions to be submitted through the module.

***Optional Component.*** A PDF copy of the calorie guide was provided to participants who were assigned to the control group. They were allowed to print the guide off and use it in their personal life to make better food choices. Again, this content was selected for the control module because the control group participants were not able to actively engage in any food substitutions because they were in Phase 1 during the control module. When in Phase 1, participants are not allowed to consume any food that isn't provided exclusively by HMR, with the exception of fruits and vegetables.

### **Procedure: Part III**

**Post-assessment battery and Social Validity follow-up.** Participants who participated in Part I or Part II, including those who were in the control group for Part II, were invited to participate in Part III. Part III consisted of a re-administration of the assessment batteries that were also administered during Part I. This will occur immediately after the last meeting of the cohort for Phase 1 of the HMR program. Specifically, every participant was asked to complete the DASS, the AAQ, the SF-36, and the SS-A. Participants were also asked to fill out the social validity questionnaire (see Appendix G) to determine the social acceptability of the intervention and explore the impact the participants thought the intervention had on their lives and goals toward health and weight management.

## **Independent Variables**

**Goal setting plus values clarification training (Part II).** The intervention, the training modules, occurred in Part II of the experiment. The participants assigned to the experimental group (approximately 50% of the individuals in each cohort) completed both the values clarification module and the goal setting module online via computer. The values clarification module educated the participants and helped them to clarify their values according to health, weight loss and physical activity. Each main section of the module ended with a multiple choice question the participants were required to answer to determine if they were attending to the modules. Each question directly corresponded to the values clarification literature, which was also provided during the modules as audio-video clips with optional text available.

In addition, participants in this group also completed the goal-setting modules immediately after the values-clarification module. The modules educated the participants and helped them to set achievable goals for their health and weight loss. Each section of the module ended with a multiple choice question that the participants were required to answer to determine if they were attending to the modules. Each question directly corresponds to the goal-setting literature, which is also provided during the modules as audio-video clips with optional text available. Note that, though it wasn't possible to require participants to retake a module they answered incorrectly, this data was collected and analyzed to determine if the participant's performance had an effect on their overall results.

## **Integrity of the Independent Variables**

The training modules were developed specifically to target health and weight management behavior in individuals completing an intensive diet program. To ensure that participants are participating in the educative components, a series of multiple choice questions were presented at the end of each main segment. Participants were required to answer the questions and their answers were recorded, though the Qualtrics technology does not allow for requiring the correct response before proceeding. However, since responses were recorded it was possible to correlate the number of correct responses with the effectiveness of the intervention and participant outcomes.

#### **Assessment Batteries (Pre and Post)**

**DASS.** The Depression, Anxiety and Stress Scale (Lovibond & Lovibond, 1995) is a self-report questionnaire that takes approximately 5-10 minutes to complete and is 21 items long. It is a condensed version of the 42 item version (DASS 42), and is utilized to assess general anxiety, depression and stress in adults. The DASS 21 takes half the time to administer when compared to the DASS 42, but is slightly less reliable in terms of score for each of the three main areas (depression, anxiety and stress). However, multiple studies have determined that the two are similar in terms of results (Lovibond & Lovibond, 1995). The DASS has been used in research successfully in the past (Chase, et al., 2013). The DASS was presented at two time periods, during Part I and Part III of the current research and helped determine pre- and post-test results of the intervention on possible depression, anxiety and stress.

**QOL Scale.** The quality of life scale that was utilized is the short-form survey quality of life survey (SF-36) which was developed specifically for medical outcomes. It

has been shown to be validated and reliable for measures of physical and mental health (McHorney, Ware, Rogers, Raczek, & Lu, 1992; Ware & Sherbourne, 1992). The survey is 36 items long and delineates the effect of weight on multiple areas of health including limitations in physical activities, limitations in social activities, and limitations in usual role activities, bodily pain, general mental health, vitality and general health perceptions. The tool also separates mental and physical health factors within sections. The SF-36 was presented at two time periods, during Part I and Part III of the current research and helped determine pre- and post-test results of the intervention on the reported quality of life pre- and post- intervention.

**AAQ.** The Acceptance and Action Questionnaire was developed to determine experiential avoidance (EA). It is a 7 item self-report questionnaire; the results of which have been shown to mediate and moderate effects of an intervention. The version being used in this research is the AAQ-2, a shorter version that is much quicker to administer and addresses some of the issues that were reported with the original AAQ (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). The AAQ-2 has demonstrated an acceptable internal consistency ( $\alpha = .70$ ) as well as convergent, discriminant and concurrent validity (Hayes, Masuda, Bissett, & Guerrero, 2004).

The AAQ was presented at two time periods, during Part I and Part III of the current research and helped determine pre- and post-test results of the intervention on acceptance and experiential avoidance, with changes suggestive of the success of the intervention. Lower scores indicate a greater predisposition to acceptance, and higher scores indicate more psychological rigidity.

Importantly, the AAQ has reliably predicted health care utilization over the span of four years (Hayes, Masuda, Bissett, & Guerrero, 2004), making it a valuable assessment to determine changes due to the intervention. Being able to alter the results to the AAQ could possibly be predictive of a decrease in health care utilization for the participants.

**Social Support Scale.** The Social Support Appraisal scale (SS-A) is a 23 item long self-report questionnaire which measures the amount of subjective support for an individual. Social support has been shown to have a strong impact on weight loss, with individuals including friends or family in their program losing more weight when participating in a weight loss program than those who did not (Wing & Jeffery, 1999). Individuals who were recruited with a friend lost 24% more weight, and maintained that loss for the follow-up months (four and ten month follow-ups were completed). Those who received an additional “social support” component of the weight loss program lost 66% more weight, and demonstrated maintenance over the follow-up months. Therefore, it was important to collect measures on social support as a moderator which can potentially affect the success of the weight management program (Sallis, et. al., 1987).

Studies have determined that the SS-A is reliable and has adequate convergent, divergent, and concurrent validity (Vuax, et al., 1986). The SS-A was presented at two time periods, during Part I and Part III of the current research and helped determine pre- and post-test results of the intervention on social support. In addition, results from the first administration were used to determine if there was any co-factorability or moderation for social support affecting the results of the intervention.

**Personal Values Questionnaire.** The Personal Values Questionnaire (PVQ) is a short, nine item questionnaire that has been used in previous literature to identify values. It only takes about five minutes to complete and assesses the origin, importance and commitment to a person's values. It walks the respondent through a number of components critical to value clarification, particularly reasons why a person holds a particular value. The measure is broken down into eight domains highlighting important areas of a person's life. The domains contained within the PVQ are Family Relationships, Friendships/Social Relationships, Couples/Romantic Relationships, Education-Schooling/Personal Growth and Development, Recreation/Leisure/Sport, Spirituality/Religion, Community/Citizenship, and Health/Physical Well-Being. While the original version of the PVQ contained multiple domains, the present research only utilized the Health/Physical Well-Being domain.

The PVQ also delineates the reason a person holds a particular value. It sorts these reasons into three categories; appetitive, avoidant or pliant. Appetitive reasons would be values held due to positively reinforcing properties of the value, or value aligned behavior. Avoidance reasons would values held for experiential avoidant reasons such as feeling guilty or ashamed if it was not their value, while pliance, a form of rule following, would consist of holding a value because of aversive control or rule-setting by another individual. The PVQ was presented at during Part II to the experimental group to identify the origin, importance and commitment of each person to the values they stated during the intervention.



**Personal Goals Questionnaire.** The Personal Goals Questionnaire (PGQ) is a modified questionnaire based on the PVQ, with an emphasis on goals in place of values. Similar to the PVQ, the PGQ has nine items and takes about five minutes to complete. Also similar to the PVQ, the PGQ attempts to identify appetitive, avoidant and pliant reasons for the goals that will be set during the intervention. The PGQ was presented during Part II to the experimental group to identify the origin, importance and commitment of each person to the values they stated during the intervention.

### **Dependent Variables: Primary Measures**

The following primary variables were selected based on their importance to weight management, the relevance to the HMR program and the ability to be measured and altered quickly. While many measures were considered and analyzed during this study, these were selected as most relevant for the current experiment. Additional measure may be added as the research continues based on future analyses and data computation needs.

**Physical activity imperative (PA).** Patients are required to track the amount of extra physical activity they engage in each day. This is distinguished from physical activity the patient would normally engage in, such as walking for their job. The patients self-report their activities in terms of the number of calories they burn each day. The data are collected from the weekly report and recorded in the patient chart by the dietician. This is one of the most important variables since it is a) a behavioral measure that changes in real time, b) is the one imperative that looks to increase a behavior that patients *are not* engaging in, instead of decreasing behaviors which patients *are* engaging

in and c) due to the initial analyses of historical data, was targeted as the measure which held the highest potential for improvement. It was also proven to be one of the measure with the highest predictability when compared to the pre- and post-test batteries and many of the other key variables.

**Meal replacement imperative (MR).** All HMR patients fully replace their caloric intake with HMR food, or food items endorsed by HMR. In order to decrease the number of people eating "Outside the Box," and ensure that patients are not devoid of the proper vitamins and minerals, there is a minimum set amount of meal replacements they must eat per day. They are required to eat at least three entree dishes and drink at least two shakes, which will satisfy a patient's required amount of vital vitamins and minerals. Meal replacement data is reported during the weekly meeting and mid-week phone call, with the dietician recording the information in the patient's chart.

**Fruit and Vegetable Imperative (VF).** Each patient is required to eat a minimum number of servings of fruits or vegetables. Patients must consume a total number of 5 servings (cups) of their choice of fruit or vegetable per day to achieve this imperative. Patients track the number of servings they consume along with their other food and activity, and the dietician records it in the patient's chart with all the other data mentions above.

**Triple Imperative.** Each participant that met all three of the imperatives (MR, VF and PA) is said to have met the Triple Imperative. This variable is an "all around" variable, since it incorporates the multiple successes that a participant has to have in order to achieve it. The triple imperative is also a good measure of treatment adherence,

since it encompasses the “HMR treatment” in its entirety. A participant only focusing on one or two of the imperatives will not be as successful with weight loss and will not be considered as fully adhering to the treatment plan. The majority of analyses in the current research will utilize the Triple Imperative in place of separating the three imperatives into their individual data sets. This is to demonstrate the importance of adhering to all three imperatives as an important single “treatment” and because it is a more robust behavior measure that requires multiple behaviors to change in order for movement to be seen in the data.

**Weight Loss.** The amount of weight lost is an important primary variable, mainly because it is the intended clinical outcome of HMR’s program. Weight loss, while occurring slowly, has been shown to be modifiable in a small number of weeks. It is feasible that an intervention early in the three-month Phase 1 program of HMR could have an impact on the reduction of weight of an individual.

Total weight loss was calculated for all participants based on their original weight in during their onboarding meeting with an HMR dietician. However, a more accurate calculation for weight loss is the percentage of total weight lost. The measure is more accurate because it takes into account total weight of the individual. A participant weighing 200 pounds might lose 2 pounds, or 1% of their body weight. A 300-pound participant losing the same amount of weight would only have lost 0.6% of their total bodyweight, since original body weight is taken into account. Measuring the percentage of bodyweight lost is a more accurate and effective way to measure the success of the HMR program. It also corresponds with the health literature which has shown that a

small amount of total bodyweight (smaller than 5% in some cases) can result in substantial health benefits. (Blackburn, 1995; Pasanisi, Contaldo, de Simone, & Mancini, 2001)

### **Dependent Variables: Secondary Measures**

**Changes in response to assessment batteries.** Pre- and post-assessment batteries were used to determine if patient's participation in the goal setting training, or the goal-setting plus values-clarification training had an effect on responses. The batteries were chosen with the intention of measuring a number of key areas that have, according to the literature, been important in weight management and weight loss (depression, anxiety and stress with the DASS; experiential avoidance with the AAQ; quality of life with the SF-36, social support with the SS-A). These batteries were administered twice, once before the intervention (Part I) and the other after the intervention (Part III).

**Social validity and patient satisfaction.** Social validity, first articulated by (Wolf, 1978), is a concept that profoundly impacts the utility of an intervention. Wolf argues that even the most effective interventions and treatments will not be utilized or continued by participants, consumers or society if they are not satisfied with the results and with the intervention itself. In other words, interventions will fail if the target population does not like the intervention or the outcome, regardless of the success of the intervention. A social support measure was developed to determine the social acceptability of the intervention, as well as the likelihood participants would use it again and the likelihood they would suggest it to a friend. Thus, the current study incorporated

a social validity measure regarding their participation in, and satisfaction with the intervention. Participants were asked if they utilized the optional goal setting planner if they were part of the experimental group, as well as if they believed these optional materials were helpful and resulted in beneficial outcomes. The social validity questionnaire also included questions regarding the use of the optional values-clarification calendar, if they were assigned with the experimental group, and if these tools were able to help them achieve their health and weight management goals or help them live in line with their health values. The social validity questionnaire included questions about the calorie guide module, if they were assigned to the control group, and asked if the tools provided were able to help them achieve their health and weight management goals.

**Module Completion Rate.** The number of participants who complete the assigned module is a quantitative way of determining patient satisfaction with a particular intervention. If there is a high rate of completion it can be assumed that the intervention was acceptable, or at least not unpalatable. If there is a low completion rate, it can be assumed that the intervention would not be as effective in the real world since most participants give up before completion. Data was collected on the number of participants in both the experimental group and the control group to determine if there was any difference in the number of participants that completed their assigned module. Completion data from the experimental group was also compared to completion rates from other, similar ACT interventions.

**Value Quality Assessment.** One important variable which has yet to be researched in ACT or values clarification research is the quality of the value statement generated by participants. This variable was added after a suggestion that the quality of value which was generated by participants in the experimental group might have an effect on their other results. Therefore, a coding system was developed (Appendix H) in order to assess the quality of each participant's generated value statement. The current standard for ACT and values clarification research has been Likert-scale questionnaires (Batnik, Jansen, Peeters, 2015). These questionnaires are traditionally administered as pre- and post-tests or longitudinally to determine changes based on the ACT or values-clarification exercises. There is current no reference in the ACT and values clarification literature regarding any indication to assessing the value "quality" when researching the outcomes of ACT and values clarification. The researcher in any ACT or value clarification study has yet to directly analyze the value statements that the participants generate as a major variable.

It is possible, however, that the value which is generated could have a moderating effect on the dependent measures, altering the success of the intervention depending on the generated value's "quality." The generated value might not directly pertain to the content of the intended intervention. For example, if the intervention was focused on values pertaining to health, the participant might generate a value regarding looking good, rather than being healthy. It is also possible that the participant could merely generate a short value which is technically within the scope of the research but does not demonstrate a personal value in relation to themselves as an individual, such as a response like, "health is important," or, "people should try to be healthy." While these

responses would both be about health, they do not demonstrate the participant has thought about their own health values. In previous research, these differences in value quality have not been examined, which could have a profound effect on the experimental outcomes.

If conducted through an online or e-module, the value's quality could also be a measure of how well the participant understands the educational components of the ACT and value-clarification intervention. It is possible that a participant might not understand the module's content, leading to a lower quality values statement, which could have a diminishing effect on the benefit from the modules. There may be some misconceptions or an incorrect understanding of values and ACT when a trained professional isn't able to provide elaboration on content, or clarify concepts for the audience. Misunderstandings can lead to frustrations or confusion, resulting in less than complete value statement generation by the participant.

This can be seen in one of the participants for the current study, who entered a value of "X" when asked to generate a value statement in regards to their health. A value statement such as this does not indicate an understanding of value-clarification, does not reflect a thoughtful self-assessment of one's own personal values and did not provide adequate contact with the value for the follow-up of this study (e.g. the values calendar). At this point, values such as this, and others of higher quality but that still demonstrate a low rate of effort and thoughtfulness have not been analyzed separately from values of higher quality to determine if there is any impact on experimental outcomes. (see the Results and Implications sections for further analysis of this participant.)

Since there has yet to be an assessment of value quality in relation to outcomes in the literature, an initial framework was developed and implemented for the experimental group in the current study. While there has not been work done within the ACT literature on the topic of quality, there is a study (Fitzpatrick, et. al., 2016) which utilizes thematic analysis (Braun & Clark, 2006) to code the spoken word responses of 16 participants after they completed an ACT workshop. Participants completed a values-clarification workshop and then were interviewed three months later. Their responses were coded to determine if there were themes as to why the workshop was successful. However, the interviews did not include a discussion of the values which they generated and it did not evaluate the quality of the values they generated during the workshop.

Similarly, Baker, et. al. (2015) conducted a thematic analysis on a series of faculty interviews at a medical school to determine areas of concern and strength during a curricular change. The coding system was developed based on responses faculty members made during in-depth, personal interviews. Statements from the faculty were used to create a coding scheme utilizing thematic analysis (Braun & Clark, 2006). The statements were coded and quantified in order to better understand the areas of concern and the frequency which faculty were mentioning them. The coding system used in this study, however, did not include an assessment of quality. The outcome of thematic analysis is not an evaluation or assessment, but rather an identification of common themes which are discussed. While some coding has been used in the literature, thematic analysis of current data is not feasible. Another method is needed in order to discuss the quality of statements which participants make.



Perhaps the closest thing to a detailed coding system in ACT was developed to assess therapist interactions during ACT interventions (Plumb & Vilaradaga, 2010). Plumb and Vilaradaga (2010) created a coding system to evaluate the behavior of the therapist while interacting with a client. However, the focus of this research was on the ACT therapist, and his or her behavior while engaging with a client, not as a result of something the client generated his or herself, and it did not pertain to the quality of value statements generated during a session. The coding system used by Plumb and Vilaradaga is also not applicable because the coding system requires an in-person, observable session and could not be utilized with the online format of the current study.

The main goal of the coding system presented in the current research is to calculate quality, not content of the statements since each participant was given a specific theme to discuss in their value statement. Two main areas of quality were selected. The first is a rating of grammar and spelling. This area was selected because a value statement that is properly formatted and with limited spelling errors is more likely to be a value statement that is well thought out and mindfully written. Proper grammar and spelling is an observable correlate to a statement which has been crafted and carefully constructed.

The second area is content. There has been extensive research conducted on content validity and face validity and their use as a validation tool. It is somewhat of a misnomer to discuss the outcome of a test as “content valid” since this term only refers to the validity of a test, and not to that of the outcome or contents of a test. However, for the purposes of this study we will treat the intervention of values clarification and the

value statements which have been generated as a measure of validity in order to begin to establish the utility of the quality coding system.

### **Data Collection and Analysis**

Historical data from prior or currently enrolled HMR patients were collected using Microsoft® Excel from the hard copy versions of the historical records. Current data on the success of the HMR program at UNSOM was collected from 63 randomly selected files representative of previous individuals who completed Phase 1 of HMR. These results are discussed in the results section. Additionally, the adherence to each of the imperatives and data regarding the national average and the HMR gold standard set by the national HMR office are discussed.

Intervention data was collected using a similar method; utilizing the same patient information sheets and, for the most part, the same HMR staff members conducting the assessments for the participants. All data will be managed in Microsoft Excel®. Experimental data will be analyzed a number of ways, using descriptive, plus additional methods to determine effectiveness on a more molecular scale. The use of inferential statistics is not used, though the research presented is ongoing and inferential statistics will be used when once the sample size is large enough for meaningful analyses to be run.

A power analysis using the computer program G\*Power was conducted to estimate the sample size needed to reach significance for a two-tailed, dependent T-test comparing the pre- and post-test assessments from Part I and III. With the assumption of a moderate effect size ( $d=0.5$ ) with an  $\alpha$  error probability set at .05 and power ( $1-\beta$  error

probability) set at 0.95, resulting in a total sample size of 54 participants per group to reach statistical significance.

A power analysis conducted for a repeated measures, within factors 2x2 ANOVA was conducted utilizing the same program. A moderate effect size was estimated at 0.2, with an  $\alpha$  error probability set at .05 and power (1- $\beta$  error probability) set at 0.95, resulting in a total sample size of 84 participants across both groups to reach statistical significance. This results in a required 42 participants per group before inferential statistics might begin to be calculated for a significant result.

Though power analyses were run for the groups in both the aforementioned areas, it should be emphasized that no inferential calculations were conducted, due to the small sample size of the current body of participants. Since there was unforeseen difficulty recruiting a large number of participants, the inferential calculations have been postponed until there is a larger population of participants. These types of analyses will be made available at a later date for purposes of further research and publication.

In addition to the power analyses, the effect size of the dependent variables was calculated, along with other statistics to determine the substantive significance of the present research (Ellis, 2010; Olive & Smith, 2005), both between and within groups. As aforementioned, these analyses are important to calculate the overall effect of the intervention at the individual level to determine if it was successful for the individuals in the group and not merely a difference between each group overall. This is supported by research and reviews demonstrating the need for developing more applicable research strategies for assessing the development of behaviorally based interventions for prevalent

societal issues (Carroll & Rounsaville, 2007). In other words, the research shows that the use of inferential statistics in fields where scientists deal with societal issues that affect individuals (such as psychology) is not an ideal way to conduct research. Additional methods should be used to determine if results are significant.

Linear regressions were calculated, using the responses from the pre- and post-batteries (Part I and III) in comparison to a variety of dependent variables. The results were used to suggest the mediating effect and discuss the possibility of predictability that the batteries had on the outcome of the dependent variables. This includes regression analyses on the AAQ, SS-A, DASS and SF-36.

Univariate analyses were conducted on the primary and secondary dependent variables to determine distribution of the “success” of the program. Each group (experimental and control) were compared, using criteria important to the success of a weight loss program. Specifically, measures were taken regarding the number of “relapses” that occurred while completed Phase 1 of the program. While this is only descriptive in nature, it helps quantitatively highlight the number of patients who can be said were “successful” at weight loss.

Lastly, single subject, visual analysis was used. Single subject data analysis is ideal for health research, allowing the researcher to get a more molecular view of each participant instead of lumping all participants into groups (Kazdin, 2010). The results from interventions like the current research is only relevant to individuals if it is functional on the individual level (Baer, Wolf, & Risley, 1968). Even if inferential statistics suggested significance, the intervention may not achieve clinical, or social

significance (Wolf, 1978). Moreover, health professionals deal with individuals, not large datasets, making it important to track individual data. If a patient isn't responding to a particular treatment, a health professional will need to modify treatment; impossible to do with a simple pre- post-test group design. Therefore, single subject data methods should be utilized so that each participant is considered as an individual, and not a small part of a larger group.

### **Inclusion/Exclusion Criteria**

To be included in the historical or continuing data which was collected from existing files, patients had to a) have completed Phase 1, b) not currently be enrolled in Phase 1 at the time of data collection. Those in the Historical group could not currently be enrolled in the HMR program, but have at some point completed Phase 1. Those in the continuing group had to still be enrolled in an HMR program, but could not be in Phase 1. The continuing group could have re-enrolled in Phase 1 at some point, but had to be enrolled in Phase 2 at the time data were collected.

To be included in the current research, participants must have been enrolled in Phase 1 of the HMR program at the time the study was conducted and have completed at least 10 of the 12 class sessions required. In addition, each group must have completed their respectively assigned modules (values clarification plus goal setting for the experimental group, the calorie guide module for the control group) within a week of signing the consent form. There was not an exclusion criterion for the number of incorrect questions answered during the modules, though the multiple choice answers were collected and scored. Participants were excluded if they were consistently missing

the IM/RM weight. This is the estimated weight of the patient calculated from their self-reported data. If their self-report and their IM/RM weight did not match, it could have been indicative of a misrepresentation of the data being reported. While data misrepresentation is only one possible explanation, for the purposes of this research, the data was excluded from analysis. Finally, individuals were excluded if staff reported that they did not regularly comply with HMR procedures, meaning that they were not properly engaging in the HMR program which would lead to poor results and inaccurate data collection.

### **Inter-Observer Agreement (IOA)**

Health and HMR data was transcribed from existing health records completed by the health professionals in the HMR office. All records recorded by the staff were assumed as accurate. To insure that the transcription of the data was correct, two members of the research team transcribed duplicate health records for 30% of the data in order to perform reliability checks. True/False equations were programmed in an Excel spreadsheet comparing the two data entries. These equations designated if the information entered by the two members of the research team was equivalent. Reliability was determined by the percentage of agreements, divided by the number of opportunities there will be to agree or disagree and multiplied by 100. Reliability checks were similarly conducted on the data for the pre- and post-batteries, as well as the content of the goal and value statements generated by the experimental group. Reliability was calculated with 30% of the data being duplicated and run through the Excel True/False equations. Data from the online modules was downloaded directly from the Qualtrics

server and will also be assumed as accurate, and therefore did not need IOA to be calculated.

## **Results**

The aim of this study was to assess the additive effects of online values clarification and online goal setting procedures on measures of a) weight management and b) behavior change of individuals in a weight management program, paying specific attention to physical activity. The focus was on behavioral measures, specifically physical activity due to the reasons previously mentioned. Behavioral measures give a better, more immediate account of the intervention's success and are more indicative of weight-loss as the person progresses through the program. The focus on the percentage of total weight lost was similarly preferred since it gave the most contextual measure of success for a weight loss program by factoring in the original starting weight of the participants.

It is important to reiterate that the control module was specifically designed to be in-active, so that it would not have any effect on the behavior or outcomes for the control group. This is because the content in the control module had to do with food choices external to the HMR Phase 1 program. Since Phase 1 does not allow any external food to be consumed, the control group was not able to utilize the knowledge they gained from the control module to alter their HMR experience in any way. In addition, the claim that the control module was inactive was supported by the social validity results collected from the control group. Participants explicitly supported this in their comments provided in the social validity questionnaire. Responses to the open ended question on the overall

effectiveness of the study include, “Sorry. Made no impact on me at all,” “Not really,” and, “I am not sure they had much of an impact on my overall weight loss or well-being. I get much more out of the classes and the one-on-one with the dietitian when I am weighed weekly than I did from this study.”

The results of the analyses will be discussed below, beginning first with the calculations conducted for IOA and the IRA calculated on the values quality coding system specifically developed for the current research. These demonstrated the effectiveness of the coding systems and agreement between two researchers regarding the data collection and coding of important research material. Primary results pertaining to changes in weight and behavior, including physical activity and other behavioral measures are also discussed. The results suggest that there were marked differences between the control and experimental group, especially in terms of the use of values and goals in mitigating the loss of motivation while losing weight, and suggested that values clarification is an effective way of coping with the weight loss process. Descriptive analyses were also conducted on variables such as the PVQ and PGQ, the social validity survey and an analysis of weight relapses.

Secondary analyses were conducted on correlation coefficients, which were calculated for the pre- and post-batteries (Phase I and III) in relation to behavioral and weight-loss outcomes. The results below discuss the interactions of the results of the batteries in relation to actual outcomes and the potential of predicting success based on the battery results. Furthermore, there is potential evidence that demonstrates the mediating effect that values clarification can have on social support for weight loss.



## **IOA Results**

Inter-Observer Agreement was calculated for the scoring in three areas of the present research 1) the data transcription of the medical records collected from HMR, 2) the pre- and post-test batteries for each participant and 3) the content of the values and goal statements generated by the experimental group. A graduate student trained in data entry and certified HIPAA compliant entered in 100% of the data from patient files. The current researcher selected 30% of the participants (12 total participants) to transcribe so as to guarantee accuracy. The total number of agreements was divided by the total number of data points (2132/2136) and multiplied by 100% for a total of 99.8% agreement. The same procedure was followed for the pre- and post-test battery scoring. The number of agreements was divided by total number of data points (1044/1056) and multiplied by 100% for an agreement of 98.9%. Inter-observer agreement was also calculated regarding the content of the value and goal statements if they included a reference to physical activity. A physical activity reference counted any goal or value that contained the work “activity,” “active,” “exercise,” “workout,” “PA,” “fitness” or any variation thereof in addition to any reference to a specific activity such as walking, hiking, jogging, etc. Inter-observer agreement was collected on a total of seven (33%) participant’s value statements and goal statements by the current researcher and a trained graduate student, with the current researcher coding 100% of the statements and the graduate assistant grading 33% of them. The number of agreements was divided by total number of possible agreements (13/14) and multiplied by 100% for an agreement of 92.8%

## **IRA Results**

Inter-Rater Agreement was calculated for the value quality coding. IRA was collected on a total of seven (33%) participant's value statements by the current researcher and a trained graduate student, with the current researcher coding 100% of the statements and the graduate assistant grading 33% of them. The number of agreements was divided by total number of data points (12/14) and multiplied by 100% for an agreement of 85.7%.

The quality rating system presented in this research should be considered the first step in calculating the quality of a value generated by a value clarification exercise. Additional work should be conducted to further refine and elaborate on the research into value "quality" to determine if there are other implications that the quality of a value statement has on the potential outcome of the clarification process. Additional evaluation can be conducted to analyze the rating system itself. There are opportunities to expand and elaborate on the system, making it more comprehensive and applicable to other situations, not just the HMR weight loss program. Further development should include ACT and RFT researchers who are familiar with the other areas that values clarification can be applied.

## **Primary Analyses**

Primary analyses were conducted to determine if there were any suggested differences between the experimental group which received the values clarification and goal setting modules and the control group which received the HMR calorie guide. This includes analysis at the group level, with overall averages of the group's data in

important HMR areas such as the triple imperative, physical activity and the desired outcome of weight loss. Additional analyses were conducted to compare differences in the potential for each group to improve performance as calculated by the PIP, and a calculation of the effect size of major HMR variables such as the triple imperative, physical activity and weight loss. Additionally, the highest and lowest performers in two categories, weight loss and physical activity were assessed and analyzed to assess the similarities and differences between the experimental and control groups.

Glass' delta was calculated for three datasets important to the HMR program (see Table 1). The average weekly achievement of the triple imperative was measured, along with the average expenditure of physical activity and the total amount of weight loss per participant after the completion of HMR Phase 1, at Week 12. The largest effect size was the difference between levels of average physical activity, with a delta of 0.75. This is a moderate effect size, almost reaching the 0.8 requirement to be considered "high." The achievement of the triple imperative was also moderate, with an effect size of 0.55. The lowest was actual weight loss, with a small effect size of 0.14.

The percentage of participants from each group that met the triple imperative was calculated for each week of HMR Phase 1 (see Figure 1). Both groups show a marked increase in the percentage of patients who reported achieving the triple imperative each week, with the lowest scores being the first week. This pattern was consistent with anecdotal evidence and reports from HMR stating that it takes a week or two for patients to get used to the program requirements. There was a slight increase after the intervention in each group (during Week 4), but both reach a relatively steady rate, with

the exception of Week 10 where there is a drop in the control group and an increase in the experimental group. Weeks 11 depicts a reversal of each group with the control group down to 63.1%, and the experimental group increasing to 85.7%. There was then a reversal where the experimental group decreases to 73.7%, lower than the control groups 82.3%. There was then a final, smaller reversal, during Week 12 though each group remains similar with the experimental group at 81.25% and the control group at 73.3%.

The average percentage of participants meeting the triple imperative over the nine weeks after the intervention demonstrated a more visible difference between the two groups (see Figure 2), with an average of 78.6% (SD 0.11) for the experimental group and a 70.83% (SD 0.11). This resulted in part because of a few sharp increases in experimental participants adhering to the triple imperative during Weeks 7 and 10, with a substantial decrease of adherence for participants in the control group during Week 10. The results were not able to demonstrate statistical significance due to small sample size, but there is a possibility there is significance if the pattern continues.

The average number of calories burned during participant's physical activity from each group was calculated for each week of HMR Phase 1 (see Figure 3). The three weeks during baseline have the two groups reporting relatively similar activity levels. Week 1 had the control group reporting more physical activity, with Weeks 2 and 3 showing the experimental group at higher levels. However, after the intervention, the experimental group maintained a higher level of physical activity every week except during Week 8, where there is a jump in reported activity from the control group. There was also a pronounced increase in the amount of activity reported by the experimental

group immediately after the intervention, with an average of 2306 in Week 4 and an even higher average of 2595 during Week 5. This increase maintained during Weeks 6 and 7 before dropping down to a slightly lower level, even though it held at approximately 2250 calories per week throughout the rest of Phase 1. The control group also saw an increase, though it was less pronounced. A decrease in reported physical activity was seen sooner than the experimental group, with activity declining after Week 6 instead of Week 7. The control group then maintained a steady average of about 2000 calories, the requirement to meet the physical activity imperative, with the exception of a large increase in Week 8.

The overall average for the time period after the intervention showed a marked distinction between the experimental and control group, with the experimental group (Figure 4), averaging 2397.18 calories per week (SD 123.7) and the control group averaging 2130 per week (SD 143). This difference was a result of the consistently higher reports of physical activity across almost every week for the experimental group. This also resulted in less overlap between the two standard deviations. While the sample size was too small to realistically use statistics, these results suggested that differences will be significant if similar patterns continue during data collection for calculation purposes.

The cumulative average percentage of participant's weight each week from each group was calculated for each week of HMR Phase 1 (see Figure 5). The amount of weight each group lost was similar during baseline, with slightly less weight lost by the experimental group during Week 3. After the intervention the amount lost stays

relatively similar until Week 7, where there begins to be differentiation between the two groups. At Week 7, the experimental group began trending downward with more rapid weight loss, with the control group losing slightly less each week. At the end of Week 12 the slightly greater downward trend in the experimental group resulted in a loss of 11.52% for the experimental group and 10.88% for the control.

A similar comparison between the average percentage of bodyweight lost after baseline between the two groups showed the experimental group with an average higher weight loss percentage (see Figure 6). The higher average weight loss per week further supported the cumulative graph showing a steady increase in amount of weight lost per week over the control group. Data were only collected on the nine weeks directly after the intervention, but it can be suggested that the trend would continue on after Phase 1 and could result in even greater losses for the experimental group.

The potential to improve performance calculation was applied to two of the main HMR goals, based on the HMR gold standard and the national average which is calculated and provided by HMR headquarters every year (Table 2). The potential for improving performance (PIP) is a concept developed by (Gilbert, 2007) in order to help guide behavior change. It was developed for organizations as a measure of competence; to determine the amount of improvement that could be feasibly increased. Traditionally PIP is portrayed as the distance between the performance of an “exemplar,” or ideal with the current level of performance. The outcome is a ratio, or the increase in performance needed to achieve the ideal. This ideal is always changing as new exemplars and ideals are always changing and improving, but for the current proposal it will assumed to be

static and based on the two major measures of the gold standard and national average. The two measures provided by HMR are for the physical activity imperative and the triple imperative. Other measures such as attendance at weekly meetings and making the weekly phone call were omitted from the current analysis. Both the experimental and control group were higher than the national average in terms of the average number of patients who met the minimum physical activity and triple imperative goals each week. Additionally, both groups were relatively similar, with the experimental group averaging 72.28% meeting the physical activity requirements and 61.16% achieving the triple imperative, while the control group averaged 72.27% for physical activity and 64.45% for the triple imperative. These similarities were also evident when calculating the PIP compared to the HMR goal standard. The experimental group's PIP for physical activity and the triple imperative was 1.25 and 1.19 respectively. The control group's PIP was almost identical, with 1.25 and 1.13 respectively.

The traditional PIP analysis compared the performance of the highest individual (the exemplar) to the performance of other individuals doing the same job in similar circumstances (Gilbert, 2007). This PIP calculation was compared to the HMR Gold standard, or goal the HMR sets for their franchises to reach. There was no evidence of any HMR program actually reaching these standards consistently. Therefore, the PIP was compared to the current results with an idealized outcome, not an exemplar that demonstrates an achievable level of performance. As shown in the table, the current results were above the national average provided by HMR headquarters.

Four groups were targeted specifically to determine if the intervention had different effects on different populations of individual; specifically, the high and low performers of key categories for both the experimental and control groups. First, comparisons of weight loss were compared across high weight loss performers. The “high” groups included the top 15% of individuals for both the experimental (n=3) and control group (n=3) that had lost the most overall percentage of original bodyweight. During baseline the high group maintains similar patterns of physical activity (see Figure 7). The two groups begin to differentiate during Week 5, with the experimental group reporting higher physical activity than the control group consistently for the rest of Phase 1. There was an increase in physical activity for the control group during Week 6, but the control group’s pattern remained on a flat trend, averaging close to the 2000 calorie goal set by the HMR physical activity imperative. The experimental group continued to report a higher level of physical activity after Week 5, with increases during Week 6 and Week 10, while both of those weeks averaged over 2500 calories.

The participants in the high weight loss group demonstrated relatively similar patterns in the analysis of the cumulative percent of weight lost per week (see Figure 8). The high weight loss performers for the control group had a steady rate of decline, resulting in an average cumulative loss of 13.9% of their original bodyweight. The experimental group’s high weight loss performers had a similar pattern, though there is a dip during Week 6 and Week 8 which maintains a slight differentiation until the end of Week 12 with an average total of 14.9% original weight lost.



Second, the outcomes of low weight loss performers from each group were analyzed. The “low” groups included the bottom 15% of individuals for both the experimental (n=3) and control group (n=3) that had lost the least in terms of overall percentage of original bodyweight. There was a distinct differentiation between the low performers in the experimental group and those in the control group for physical activity (see Figure 9). In the experimental group there was an upward trend during baseline, with the amount of physical activity reported activity increasing even more after the intervention, culminating in Week 7 where an average of 3009 calories of activity were reported. There was then a decrease in reported activity, falling below the activity reported by the control group for the only week after the intervention. There was then a steady climb back to over the 2000 calorie goal until the trend appears to stabilize slightly below 2000. The control group had a slight downward trend during baseline, with an increase in activity after the intervention, though the activity did not increase up past the 2000 calorie goal. The trend seemed to stabilize around 1500 calories of activity a week except in Week 12 where there was an average of 0 calories of activity reported.

The bottom weight loss performers began baseline with a notable difference in cumulative weight loss between the two groups, though they converge on Week 3 to approximately the same cumulative weight loss due to a steep decrease in the control group (Figure 10). After the intervention the control group maintained a downward trajectory, though not as steep as seen in the baseline period. Then Week 8 began an increase in weight before a final dip in weight during the final week (Week 12). The experimental group, however, began a steeper downward trend after the intervention, with a slight decrease in momentum during Weeks 8 and 9, but again dipping towards a

steeper trajectory during Week 10 through 12. The two divergent trends resulted in an average loss of 3.8% for the control group and a 7% decrease for the experimental group. This suggests that the experimental group and the control group differed more in terms of the performance of the low performers, while the high performers of each group remained consistent regardless of their exposure to the modules.

Third, high performers of physical activity were analyzed as exemplars (see Table 11). The “high” groups included the top 15% of individuals for both the experimental (n=3) and control group (n=3) that had reported the highest average overall physical activity. The baseline levels for both groups were initial unsteady for reported physical activity, though the last two data points were relatively close to each other, with the control group being slightly higher than the experimental group. After the intervention, the experimental group had a slow increase in physical activity, trending upward until Week 7, where it leveled off at about 3000 calories with a slight downward trend in Weeks 10-12. The control group had an immediate increase in Week 4, but then maintained a downward trend throughout the rest of the program.

While there was a difference between the physical activity between the two groups, there was very little difference in terms of weight loss (see Table 12). The two groups were almost identical during baseline. After the intervention, the control group lost slightly less weight, though a steeper downward trend between Week 6 and 8 kept the weight loss rate similar between groups. The experimental group showed a steady downward trend slightly steeper than the control group, though Week 10 decreases the drop, bringing the groups close together again. As a result, there was little difference

between the final average accumulative weight loss percentage, with the control group losing 12.1% and the experimental group losing 122.8%. There was a difference between the amounts, but it is small.

Lastly, low performers of physical activity were analyzed (see Figure 13). The “low” groups included the bottom 15% of individuals for both the experimental (n=3) and control group (n=3) that had reported the lowest average overall physical activity. The experimental group’s baseline data on physical activity trends upwards, though it remained below the 2000 goal set for the physical activity imperative by HMR. After the interventions there was a three-week period (Week 4 through 6) where the group reported a rise above the goal. This was then followed by a large decrease to 1500 calories, with the average remaining below the 2000 goal for the rest of the weeks, though there was a notable increase in Week 10. The control group reported even lower levels of physical activity than the experimental group during baseline. The control group also had an increase during Week 4 and 5 before levelling off and maintaining a trend around 1500 calories for the rest of the weeks.

There is a noticeable difference between the low physical activity performers across the control and experimental groups for cumulative weight loss (Figure 14). During baseline the experimental group had an almost flat trend, followed by an immediate drop in Week 4, with a sharp downward trend that slowed slightly during Weeks 6 through 8 but continued until Week 11. Week 12 showed a slight increase in weight, though it remained below the control group. The control group began with a downward trend, both in the baseline phase as well as after Week 4. The downward trend

began to slow at Week 5 and continued until there was another moderate drop in Weeks 11 and 12.

The quality of each participant's values were rated utilizing the scoring system developed for the purposes of the current study. Comparisons were made between the top 15% (n=3) and the bottom 15% (n=3), as rated by the scoring system. Figure 15 depicts the average physical activity across the weeks between the two groups. During baseline the high value group trends upward, but dropped immediately after the intervention. There was then a steep upward trend with a peak at 3043 in Week 6, followed by a decrease to below the 2000 goal during Week 7. The activity level then recovered and remained on a trend line above 2000 until the end of Phase 1. The low value group's baseline had a slight downward trend, followed by an immediate jump after the intervention. However, the low quality group then maintained a downward trend that was consistent throughout the rest of Phase 1, with a more drastic decrease in activity during Week 6.

Figure 16 shows the high and low quality value groups' total cumulative weight loss. Both demonstrated a slight downward trend in baseline, with a larger decrease immediately following the intervention. After the initial drop, both groups showed a shallower trend until Week 8, where the low value quality group began losing less than the high value quality group. The high value quality group continued to lose weight at a higher rate until Week 12, where they reported weight stagnation. The low value quality group lost less than the high quality group, but continued losing weight until they eventually caught up to the high quality group when they stagnated in Week 12.

During the initial analyses of the data, it was discovered that one participant completed the modules and was included in the experimental group for data collection but did not complete the value generation or goal setting exercise. This was possible because the participant entered “X” into the area that required a value or goal in order to move on with the module. By entered “X,” the participant was able to bypass the Qualtrics generated requirement to respond to the exercise, because technically “X” is a response. This participant essentially did not complete the main “treatment” of the module, but did complete all the other pages and requirements of the experimental group. It should be noted that this participant received 100% on the questions in the module designed to calculate how well participants were attending to the information provided. This suggested that the participant, referred to as “Participant X” was attending to the information and just did not complete the two pages that contained the value clarification or goal-setting exercise.

Participant X’s data was compared to the average response of the experimental group in Figure 17 and Figure 18. Participant X’s physical activity was similar in the baseline phase with a drop during Week 2. There was a jump immediately after the intervention to 2938 calories of activity before decreasing to below 2000 the next week. Participant X remained below the goal of 2000 the rest of the week, with the exception of Week 7 and Week 12, with the trend remaining relatively flat. There were only two points where Participant X outperforms the average after the intervention, Week 4 and Week 12, though during Week 12 Participant X is only just slightly more active than the average.

For weight loss, Participant X had a flat baseline, losing very little weight during the first three weeks. After the intervention, Participant X began trending downward initially, but levels off again after Week 4. There was another downward trend starting Week 7 which continued on until the end of Phase 1 at Week 12. Participant X's weight loss was substantially less, with a total loss of 6.1%. The slope of the trend for Participant X was much shallower than average, suggesting that if the study were to continue, Participant X would continue to fall behind the rest of the experimental group as they continued to lose weight.

One important aspect of the experimental module was the inclusion of the PVQ and the PGQ following the value clarification module and the goal setting module respectively. Participants were asked to rate their responses to questions gauging their commitment to their recently clarified values and recently set goals (see Table 3). Participants rated the importance of their value and their commitment to acting within their values as higher than their goals, as shown by rating their values at 4.71 and their goals at 4.33. Their commitment to their values was also higher (4.62) than their commitment to their goals (4.38). The response to the desire to improve their progress was identical, at 4.05 for both goals and values.

Other similarities included questions regarding the vitality and meaning the participants found when pursuing their values and goals. Participants rated the statement, "Making progress towards this goal/value makes my life better, more meaningful and/or more vital," as 4.24 for their value and 4.1 for their goal. The reason why each statement was important to the participant was the same across values and goals, with the highest

reason being rated as “These values/goals are important to me, whether or not others agree,” with values rating as 4.52 and goals as 4.1. However, it can be suggested that goals maybe have still been under the control of social pressure, since the rating on statements like, “I would feel guilty or ashamed if I didn’t make progress towards this goal/value,” was higher for the stated goals (3.52) than the stated values (3.19).

Likewise, there is slightly less reported enjoyment because of the stated goals, with statements like, “I experience fun and enjoyment when I am engaged in progress towards this goal/value,” with goal statements being rated at 3.76 and the value statement being rated at 4.19.

Since the results of Participant X seemed to show the importance of engaging with “active ingredients” of an intervention, other criteria were set up to determine if there was any interaction among the variables that were collected. Four criteria were selected based on the likelihood they would be interactive and have an effect on participant outcome. Participants were selected into the group if they included physical activity in both their value and goal statement, if they gave the highest rating to the questions on the PGQ “How important is this goal to you?” and “I am committed to making progress to this goal” as well as the corresponding questions in relation to values on the PVQ (“How important is this value to you?” and “How committed are you to living this value?”). This group (n=3) is called the “quadfecta” since they met four main criteria for inclusion. They were compared to the “low” group, selected because they designated a 3 (“neutral”) or less on the same PVQ and PGQ questions (n=2).

Figure 19 depicts the average physical activity of both groups. Both are similar at baseline, with the quadfectas displaying a slight upward trend. There was an increase of physical activity, creating an upward trend that continued until Week 11 and 12, where there was a drop. The quadfecta group maintained their activity above the 2000 goal for the entire duration of Phase 1 after the intervention, achieving an average above 3000 calories of activity during Weeks 5, 9, 10 and 11. The low group also had a steady baseline with a flat trend. There was a slight increase to above the 2000 goal after the intervention, but the upward trend ended after Week 6. There was then a large decrease which slowly increased over the weeks though the group was only able to report activity higher than 2000 in the last week. Such a strong differentiation between the two groups suggested that the content of the goal as well as the self-reported commitment and importance of the goal was beneficial to achieving a successful outcome.

Figure 20 depicts the average weight loss between the two groups. Their baseline averages were already differing, though both demonstrate a slight downward trend. There was a drop in the data for both groups immediately following the intervention. The quadfecta group demonstrated a steeper downward trend, ending at an average loss of 12.9%, lower than the overall average of the experimental group. The downward trend for the low group was not as steep, ending with a loss of 7.2% on average.

### **Secondary Findings**

Four batteries were administered during Part I and Part III of the present study. They were made up of the Social Support Appraisal (SS-A), the Depression, Anxiety and Stress Scale (DASS), a survey on quality of life (SF-36) and the Acceptance and Action



Questionnaire. Participants were asked to take each battery before they began HMR Phase 1 (Week 0) and after they had completed Week 12 of the program (Week 13). Response rate was lower than that for the online module portion of the study (Phase II) with fewer participants across the control (n=12) and experimental (n=15) groups. The averages were calculated across both groups and the changes across the pre- and post-administration of the batteries were compared for each group (see Table 4).

The pretest numbers for each of the four batteries were similar across both groups, with the largest discrepancy being the SF-36, with an approximate difference between the two groups of ten points, with the experimental group reporting a slightly higher quality of life (103.18) than the control group (93). The post-test results show the same pattern of similarities, with both groups scoring within a few points of each other. The post-test for SF-36 shows a closer range between the two groups, at 118.14 for the experimental group and 119.18 for the control group which is attributable to a larger reported increase in quality of life for the control group.

Changes between the two groups were predictable from previous literature on weight loss and the literature on the batteries themselves. Both groups had a marked increase on the quality of life scale, with a larger increase seen in the control group. There was also an increase in psychological flexibility across both groups (with a decrease in the AAQ scores), with the experimental group becoming slightly more flexible than the control group. There was a similar increase in social support across both groups, but in this case there was a slightly greater increase (meaning a greater decrease in scoring) in social support for the control group. There was a greater separation in rated

depression, anxiety, and stress between the groups, with the experimental group (which was already slightly less depressed, anxious and stressed than the control group) becoming even less so. A drop was also seen in the control group, but not to the extent of the experimental group.

The batteries were also correlated with the key HMR measures the triple imperative, physical activity and weight loss (see Table 5). Many of the batteries did not provide any predictive power to the analysis, such as the DASS. Some of the batteries have some predictive validity, but only for specific areas of the HMR program. It should be noted that two of the batteries (the SS-A and the AAQ) are reverse scored so that an increase in social support for the SS-A and an increase in psychologically flexible for the AAQ result in lower scores on the batteries. The DASS and the SF-36 are both scored so an increase in the score reflects an increase in depression, anxiety, and stress and quality of life, respectively. It is also important to note that the weight data that was used in the calculations of the correlations was expressed in terms of weight loss, a negative number. So while physical activity and the triple imperative are numbers where a successful intervention would increase and result in a positive number, a successful program in weight loss would result in a negative number.

Weight loss and social support had some predictability in both the experimental and control group. There was a strong relationship between weight loss and social support for the experimental group with a correlation of 0.58, while the correlation of -0.38 demonstrates a moderate relationship between increased weight loss and increased social support of the control group. There was also a moderate correlation ( $r=0.36$ )

between weight loss and psychological flexibility in the experimental group, though this relationship is not shown in the control group ( $r = -0.03$ ). There is a strong correlation between social support for physical activity ( $r = 0.56$ ) and achieving the Triple Imperative ( $r = 0.39$ ) for the control group, but this is not reflected in the experimental group.

There are also a number of strong correlations between the outcomes of the control group and their scores on the AAQ. In the control group there is a moderate correlation between the AAQ and weight loss ( $r = 0.4$ ), physical activity ( $r = -0.72$ ) and the triple imperative ( $r = -0.72$ ). A majority of the discussion above is focused on the pre-test scores across both groups. This is because of the reasoning for the inclusion of the batteries and their correlation to performance; the current study attempted to determine if there were any predictors of success to pinpoint how HMR program. These might be used to permanently integrate components at the beginning of the program to better handle individuals who are not be as inclined to succeed before they begin. Some of the batteries were administered to ensure HMR patients were not coming to any harm during the intervention, such as the DASS. Others were conducted to mitigate potential confounds to the intervention, such as measuring social support to determine if that had a more important role in weight loss than the experimental modules.

Quality of life, as measured by the SF-36, is a self-report assessment on a person's perceived life status. The SF-36 was specifically developed for measuring changes to a person's quality of life while losing weight. An analysis of the participants in the experimental group who rated their quality of life as the highest (scored in the top 15%,  $n=3$ ) were compared to the participants in the experimental group who rated their

quality of life as the lowest (scored in the bottom 15%,  $n=3$ ). There was a distinct divergence in both physical activity (Figure 1) and weight loss (Figure 2) when comparing the groups. The initial seven weeks of reported physical activity show the higher scorers relatively equivalent with the lower scorers, with a small difference in favor of the high scorers. However, there was a marked drop in physical activity reported by the low scorers starting Week 8 and continuing until the end of week 12. This corresponds to the weight loss seen between the two groups. Both the high and low scorers remain equal during the three baseline weeks. The rate at which they lose weight changes during the fourth week, diverging more and more as the weeks continue, resulting in a net weight loss of about 11%, while the higher scorers lost an average of 13%. These results were not surprising, as they were taken as a post-test and it stands to reason that the greater amount of weight lost, the higher the quality of life. The results were also consistent with the weight loss literature (Doll, Peterson & Stewart-Brown, 2000) which demonstrate that there is a negative correlation between quality of life and weight loss.

Social support, measured by the Social Support Appraisal Scale (SS-A) is a self-report scale on the amount of social support an individual feels they receive. Social support measures have been shown to increase the success of weight loss programs, based on the assumption that behavior change is more likely to occur with a greater amount of support from the people who are considered close friends and family (Wing & Jeffery, 1999). An analysis of the participants in the experimental group who rated their social support as the highest (scored in the top 15%,  $n=3$ ) were compared to the

participants in the experimental group who rated their social support as the lowest (scored in the bottom 15%, n=3).

During data collection, it appeared that participants in the control group were reporting a higher number of weeks in which there was no weight change, or some weight gain (see Table 6), referred to as “relapses.” Further analysis determined that there was a difference between the average instances of both weight stagnation and weight gain. In the experimental group there was an 80% chance that a participant would report weight stagnation (neither losing or gaining weight) during at least one of the HMR treatment weeks (16/21). Similarly, participants in the experimental group had an 80% chance that they would report weight gain during at least one of the HMR treatment weeks (16/21). This was lower than the average chance of weight stagnation and weight gain for the control group, which was 105% and 105% (21/20 and 21/20) respectively. This means that, on average, participants in the control group would have at least one instance of both weigh stagnation and weight gain during the twelve weeks they participated in the HMR program.

However, further analysis reveals that the percentage of participants who had at least one instance of weight stagnation between the experimental and control group was functionally equivalent at 67% (14/21) for the experimental group and 70% (14/20) for the control group. This similarity was also found for the percentage of participants who had at least one instance of weight gain for each group, with 57% (12/20) for the experimental group and 60% (12/20) for the control group. This appeared to be discrepant with the findings regarding the average number of instances of relapse. To

reconcile the two results, the number of relapses per participant was calculated and averaged. Results show that the average number of instances of weight stagnation in the experimental group was 1.14 and the control group was 1.5. This suggests it is more likely for a participant in the control group to report more weeks of weight stagnation than participants in the experimental group. Similarly, the average number of instances of weight gain in the experimental group was 1.33 while the average for the control group was 1.75.

There is evidence in the weight loss literature that mistakes and “slip-ups” during weight loss have a detrimental effect on future behavior (Latner, McLeod, O’Brien, & Johnston, 2013; Szabo-Reed et. al., 2016). Mistakes can increase the probability of making another mistake in the future. The decrease in average number of weeks where relapses are reported for participants in the experimental group may be a result of the values clarification and goal setting modules mediating the effects of failure. This is also consistent with values-clarification literature, where values provide a “stress-buffer” to decrease a person’s reaction to stress, even to a biological degree (Gregg, Namekata, Louie, & Chancellor-Freeland, 2014). Seeing a clinical decrease in stress because of mistakes can allow for an increase in a person’s ability to move past the mistake and continue living in accordance with their stated values. The results from the current analysis seem to support these findings.

A social validity questionnaire was administered to participants in the experimental group and the control group after they had completed their participation in the study. The control group had a slightly higher response rate (n=11) than the

experimental group (n=8). The control group was asked a series of three questions, while the experimental group received nine questions. The discrepancy in the number of questions was because the experimental group answered an additional six questions on their use of the value and goal calendar (see Table 7). Responses were either coded on a 1-5 Likert scale, where 1 was equivalent to “Strongly Agree” and 5 was equivalent to “Strongly Disagree” or as a “Yes” or “No” where an affirmative response was coded as a “1” and a negative response was recorded as a “0.”

On average, the control group answered more favorably to the questions both groups shared. Specifically, the control group was more satisfied with the study, with a rating of 1.36 compared to the experimental group’s 2.25. The control group was more likely to select “Yes,” that the experiment had effected them (either positively or negatively) with an average of 1.09 to the experimental group’s 1.38. Lastly, the control group was also more likely to respond “Yes,” that they would recommend HMR continue the usage of the modules, with an average of 1.09 compared to the experimental group’s 1.25.

## **Discussion**

The purpose of this study was to assess the additive effects of online values clarification and online goal setting procedures on measures of a) weight management and b) behavior change of individuals in a weight management program. The two aims of the study were achieved, with both outcomes of weight management and behavior change demonstrated to various degrees. Analyses demonstrate that, even though they were only presented once, participants who received the values and goal-setting modules

were more likely to increase physical activity, achieve the triple imperative and lose weight overall. There were some measures which were more predictive of weight loss and behavior change success, and results which suggest that particular components of the modules may have been more influential than others. There was also reported social validity for the modules. The results contribute to the literature by suggesting that there are additive effects of values clarification and goal-setting training procedures conducted with online modules.

Some of batteries used during the pre-test showed predictive validity for successful weight loss and behavior change. The AAQ and the SS-A were both predictive of weight loss in the experimental group, both consistent with the literature. Psychological flexibility has shown to decrease healthcare utilization. This is supported in the literature, with Hayes, Masuda, Bissett, and Guerrero (2004) discussing the decrease of healthcare utilization for patients with high psychological flexibility over a four-year period. It would be useful for HMR to continue to run assessments like the AAQ to determine those who have a greater psychological flexibility and those that don't. It might be possible for HMR staff to better allocate resources to enhance the success between both groups.

Similarly, research into social support during weight loss suggests that the more social support someone has, the more successful they will be. However, the AAQ was not predictive of control group outcomes, and the SS-A actually had a negative correlation to weight loss. It appears that in some cases social support is not beneficial to weight loss. This may be because of the intensive and regimented nature of the HMR



weight loss program. While effective, the HMR program restricts the diet to HMR foods only, making it difficult for HMR patients to participate in any social activities involving food. Part of the orientation process for HMR includes the discussion of strategies to cope with restrictions, such as bringing the meal replacement packets to restaurants and social events instead of eating the foods provided. This can be awkward for HMR patients and so may result in patients decreasing their social interactions with their network to avoid the awkward moments during Phase 1. The result is a decrease in social support during the program, regardless of the amount of support reported during the pre-test.

Conversely, the high correlation between the SS-A and weight loss for the experimental group may be because the values clarification process helped enhance the effectiveness of a group's social support system. Anecdotally, many of the value statements that were generated by the experimental group included references to family and friends. The focus of the value may actually improve if the social support aspect is included in the value, particularly if there is an extensive network of social support already in place. The presence of the social group becomes a reminder of why the participant is engaged in the weight loss, acting as a conditioned reinforcer for weight loss behavior such as increase in physical activity and following the meal replacement plan. It could also alleviate the stress of engaging in the HMR program by decreasing the aversive aspect of some parts of the program. It may be awkward for patients to miss out on family dinner because they have to eat their meal replacement, but there might be a reduction of stress because they have clarified they are doing it for their family.

One last point to highlight is that the SS-A is not specific to support to weight loss. Anecdotally, HMR staff suggest that weight loss is much more effective if other members of the family are also HMR patients. The staff predict this is because there are fewer temptations in the household if everyone is eating the meal replacements and avoiding external foods. So even if social support is high, it is possible that the support did not transfer over to weight loss because of the extraneous variables and easy access to the bad habits of those social support groups.

The work of Sheldon (2002), as well as Sheldon and colleagues (Elliot & Sheldon, 1997; Sheldon & Kasser, 1998) has begun to examine the interplay of goal setting and values. They found that goal setting is more effective when linked to personally held values. Similarly, Chase et. al. (2013) demonstrated an increase in student performance when components of values clarification and goal-setting were combined. The results from the current study seem to support these findings. There is an increase in weight loss and behavior change when comparing the experimental group and the control group. While the results have yet to be confirmed with inferential analyses, if the trends remain consistent with a larger sample size it will provide further evidence that the modules were effective.

It also did not appear that the quality of the value statement had any effect on behavior change or weight loss. In part, this has to do with the fact that most participants scored very high on the value quality, creating a ceiling effect when it came to quality. It also may be due to the newly developed quality rating system. The system was developed specifically for the current research and therefore has not been analyzed in

terms of internal or external validity. The current rating system should be seen as the first step in the development of value quality rating to determine if there are other areas that should be included which might have more differentiating effect on value quality in addition to the work that should be done to develop the validity and reliability of the rating system.

Differences between the importance of certain components is highlighted in the results of Participant X and the “quadfecta” group. Participant X completed all aspects of the modules, answered every one of the multiple choice questions correctly, and completed every requirement of the modules except for the process of values clarification and setting goals. The results obviously demonstrate a difference between the outcomes of the rest of the experimental group who did completed the values clarification and goal setting portion, and Participant X, who skipped that component. Such a large discrepancy between outcomes suggest that the self-reflection component where participants are asked to generate their own values and goals has a profound effect on behavior and weight change. It also appears to diminish the need to educate participants about values and goals, perhaps bypassing the more informational aspects of the module in favor of the most effective portions. Similarly, results from the “quadfecta” group seems to demonstrate the complexity of the interaction of all the module’s components. In the case of this group, the values exercise and goal exercise were both completed, and they gave the highest rank for the importance of the values and goals, and their commitment to their values and goals. The group was also selected because they included physical activity references in their goals and values. This was so the focus of their values and goals included a major variable that was measured by the present study,

namely physical activity levels. So the constellation of importance, commitment, and the inclusion of physical activity in their values and goals resulted in a high rate of weight loss, and increases in levels of physical activity compared to those who expressed less commitment and thought that their values and goals were less important. These could be the major components needed to successfully modify participant's behavior and weight change with values and goals.

The differences in effect sizes highlights the difficulty of working with weight loss and the benefits of measuring other variables in addition to weight. The effect sizes between the experimental and control groups are much higher for the behavioral measure of physical activity and triple imperative achievement. Behavioral measures can be modified by an intervention more quickly, with immediate effects being seen and perpetuated over the following weeks, leading to a larger overall effect. On the other hand, the effect size for actual weight loss is much smaller. Changes in weight loss are much more difficult to achieve and involve many more factors, including but not limited to genetics and hormonal differences, differences in metabolism, sleep, stress, and medications. However, it should be noted that as an additive component to an already established weight loss program, an approximately one-hour long module having any effect on weight loss over a nine-week period should be viewed as an achievement. It is possible that the success continues for the individuals in the experimental group, resulting in a greater overall weight loss and/or a longer lasting effect of the program on overall weight and health. This is in addition to all the complications and potential differences between patients, so even a small effect can signal substantial potential in continuing this line of research.

Examining the differences between high and low performers appears to indicate that the higher performers in both groups tended to do well on all variables, while the low performers were the differentiating factor when comparing across groups. It can be suggested that high-achievers will find ways to be successful, regardless of what group they are assigned to. This is illustrated when comparing the high and low performers to the national averages. Each group can improve their performance, since there is always room for improvement, but the modules' most important effect could be to increase the success of the group which would ordinarily be less successful at weight loss. The overall averages for the group improves because the lower performers are brought closer to the high performers, but it also helps individual patients of HMR who are attempting to lose weight. This might not always be apparent in the data analysis for some variables that are based off the achievement of minimums, such as the PIP analysis which focused on the average percentage of participants who reached HMR imperatives. This covers up the increases that can be seen in the experimental group where lower performers had larger changes in behavior and weight loss that may or may not have altered the successful percentages of achieving HMR imperatives.

### **Limitations**

The results from the current study are encouraging and are suggestive that the implementation of online values clarification and goal setting modules can have an impact on the outcomes of weight loss programs. However, there are some limitations in the research which must be addressed. These may have impacted the present study's outcomes, or may have ramifications on future research.

First, there was a major shift in the organizational structure of HMR when the current research first began. A large pharmaceutical company purchased HMR and its affiliates at about the same time this research was implemented. This resulted in a number of interactions with the researcher and the HMR office in order to get permission to use the HMR program, HMR participants and HMR material (e.g. the HMR Calorie Guide) as part of the research. While it appeared that the content presented to patients remained the same and none of the processes or procedures were different on the patient end of the HMR program, it is possible that there were changes which were unnoticed by the researcher and HMR staff. These small changes might have had an impact on the patients.

Second, there was a high rate of instructor turnover during the year the research was being conducted. The turnover rate during that year was 100%, meaning all of the original instructors for the HMR class left and had to be replaced by new staff. The new staff completed the necessary training and were qualified to take over the classes. However, this could have an effect on the behavior of the patients. Introducing new staff to any situation is potential for altering behavior, in addition to the fact that the staff were the implementers of the HMR program. While there are safeguards to maintain the standardization of HMR content, there is always the possibility that differences between the instructors could have resulted in different outcomes.

Third, there was an unexpectedly small participant pool, even when collecting participants for over a year. Initial estimates stated that the number of new patients entering the HMR program would be approximately two to four a week. This number

was supported by the number of inquiries into the HMR program from potential patients. At the beginning of this research a new strategy was implemented, intending to increase the number of participants who could be included in the HMR program. This strategy was also intended to make the on-boarding process more flexible and shorten the waiting time for patients to begin their participation in HMR. However, this high estimate on new patients was not realized, and the average participant recruitment was approximately one participant per week. This, combined with the participants who agreed but did not meet the inclusion criteria or who were excluded from the study resulted in a smaller sample than expected.

Small sample sizes, while appropriate for single subject methodology, does not lend itself to inferential statistics. The power analysis suggests that additional participants are needed in order for statistical significance is demonstrated. As mentioned previously, this research is ongoing and will reach a size which will support statistical analyses.

An additional limitation to the small sample size is the dispersion of the methodological implementation. Since participation was collected for over a year, it is possible that small changes or alterations in the curriculum, staff and/or environment at HMR had an effect on the outcomes measured in this research. The high rate of turnover of office staff discussed above could have resulted in changes to weight loss measures because of the learning curve of each instructor. The instructor might have become more effective later on, after she had completed a few class sessions, meaning that participants received differing interventions dependent on the time they became patients. This

possibility is guarded against by the strict guidelines imposed by HMR in an attempt to standardize the program and maintain consistency across all their classes nation-wide, though it does not entirely guarantee uniformity. There could have also been differences with larger variables such as weather. Since Reno has cold, snowy winters it is possible that behaviors such as physical activity could have been diminished by the weather for patients that participated in the study during the winter months when compared to summer participants.

Fourth, HMR only uses self-report data with the exception of the weekly weigh-in. This means that all the data provided, including the report on physical activity and the content of the values and goal setting modules were based on the honesty of the participant. It is possible that the social pressure of following the HMR imperatives could have resulted in participants altering their self-reported results to make themselves appear more favorable or successful in following the program. This limitation extends to the participation in the module, with no way to verify that the participant his or herself was the one taking the module. There are some anecdotal reports from HMR staff of the information being considered accurate, and the weekly weigh-in can be used to verify the accuracy of the self-report measures (e.g. if a patient reports a high rate of physical activity and eating properly but they are gaining weight, their reports would be called into question) to some degree. However, it is still possible that the reports from the participants are inaccurate.

Lastly, there was no additional follow-up once the experimental group participants completed the module and received the values and goals calendar. This was



during the end of their third week of participation and no additional measures on the intervention were taken once the third week was complete. No measures were collected, for example, on how frequently participants referred back to their value statement or goals. There was also no measure of if the participants could remember their value statement. It is possible that some interacted frequently with their stated value, printing off their statement to post somewhere they could see it and remind themselves of it. Differences like these could potentially result in a high variability of how each individual participant interacted with their values and goals over the additional nine weeks of the HMR program. It is possible that more interaction with their stated value could result in a higher rate of success with outcomes such as physical activities and weight-loss, but since additional analyses were not conducted it is not possible to include that as a variable.

### **Future Research**

There are a number of areas that can be developed for future research. Firstly, the current research itself is considered ongoing. Data will continue to be collected to increase the participant population, which will allow for the use of inferential statistics. Results from the pre- and post-tests can be used in better coordinating HMR, and the outcomes of the modules can be actively integrated into HMR curriculum. A deeper process analysis can be conducted to better understand the interaction of the variables to give a more detailed account of what are key factors in weight loss. More work can be done on the value quality coding system in order to make it a validated and useful tool for those interested in quality assessments of generated value statements.

As aforementioned, there are a number of results presented above which can be substantiated by the utilization of inferential statistics. In order to run inferential statistics, additional participants are needed. The timeline for this current project did not allow for an indefinite participation recruitment strategy, and so the research will be left open after this initial analysis of results. It is hoped that time to recruit additional participants for the study will result in enough participants to provide a clear view of the additive effect of the experimental modules have on the data discussed above.

Some of the pre-tests presented have demonstrated usefulness in predicting outcomes of important HMR measures. The higher correlations should be discussed with HMR staff at UNR as well as HMR staff at the company headquarters. There are ramifications to the success of the HMR program if they use easy-to-take batteries on patients before they enter the program. Class leaders may tailor content depending on levels of psychological flexibility, for example. Or patients might be provided extra help if they are demonstrating a lower score on a quality of life scale. HMR can maximize their effectiveness by assessing patients as they come in to the program.

It is also possible that a larger effect of the intervention may be seen if the values clarification and goal setting components were more heavily integrated into the HMR program. This is evidenced by responses from the social validity survey, such as one response,

*I would encourage use of the modules only if there was follow up and more training for them. In my opinion when helping people set goals there is much more needed than answering questions and sending out forms for them to do on their own. There should be follow up and continued education...*

It would be possible for HMR to integrate individual value statements into the curriculum and have instructors ask the patients to refer to their personal value statements or goals during class or at specific points during the week. This is similar to a study of values clarification that showed that participants achieved higher heart rate frequencies when personalized values were referenced during exercise (Jackson, et. al., 2016). It could be possible to increase the amount of physical activity for an individual or the amount of weight someone loses if they are reminded of their individual values and/or goals during every class, instead of just once during Phase 1 of the program.

There are many process questions posed by the results of the current study, particularly in relation to the “active ingredient” within the experimental modules themselves. As evidenced by Participant X and the quadfecta group, it is not enough to have individuals complete the modules and expect universal improvement in behavioral or weight loss measures. There are varying levels of commitment to individual values, and how important the value is to the individual. There are also aspects of the modules which may not be important, as evidenced by Participant X. Participant X attended to the education material, completed all aspects required of the experimental group but did very poorly in all outcome measures. Though just a single subject, Participant X’s results suggest that there may be components of the modules which are more effective at achieving the desired results. The quadfecta group further highlight the interaction of factors within this applied experiment, necessitating further research on values clarification modulates in the context of differing levels of commitment and perceived importance. The differences between these participants highlight the need for future research to closely examine components and functions of values clarification exercises

and goal settings in more controlled settings. This can be done utilizing basic and analogue manipulations in order to diminish the variability of applied research.

Lastly, the quality of a value may have an important effect on the likelihood the statement will be able to modify behavior. The current research utilized a new quality assessment. The assessment should continue to be refined and developed to determine validity and utility when measuring the value quality in weight loss settings. This should be done in conjunction with researchers who conduct values clarification exercises in a myriad of settings to ensure that any new categories which are created can be applied across the areas where values are applied. Then the quality assessment can be validated for use and further discuss if the quality of the value which is generated has an impact, or if the mere process of creating a value is more important than the quality of the value produced.

In conclusion, the addition of value clarification and goal setting modules seem to have a positive effect on behavior change and weight loss. The relatively small intervention had an effect on many major variables that directly influence weight loss, such as levels of physical activity. The intervention was able to increase adherence to HMR treatment, particularly in terms of physical activity, as well as a modest increase in weight loss compared to the non-treatment control group. It also promoted a discussion regarding the important components needed for values clarification and goal setting interventions to be effective. This account may provide better understanding for similar interventions in the future, to optimize weight loss strategies in already successful weight loss programs. Moreover, training in values clarification and goal setting can potentially

be generalized to other areas of the participant's life, benefitting other areas of health as well as other aspects of a person's life such as their professional development or family life.

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*Table 1: Report of the effect sizes calculated for the triple imperative, physical activity, and percentage of weight loss between the control and experimental groups.*

	Experimental (n=21)	Control (n=20)	<i>Glass' Δ</i>
Triple Imperative	72.28% (14%)	64.45% (15%)	0.55
Physical Activity	2273.5 (272.34)	2069.62 (166.87)	0.75
Weight Loss	-10.45% (2.57%)	-10.08% (3.27%)	0.14

*Note: Glass's delta was used as a more sensitive measure of effect size than Cohen's d when there is a non-treatment control group.*

Table 2

*PIP comparison examining the control versus experimental group in terms of potential to improve performance in the context of the HMR gold standard.*

	<b>Met PA I.</b>	<b>Triple Imperative</b>
<b>Gold Standard</b>	90%	73%
National Av	56.90%	51.30%
Experimental (n=21)	72.28%	61.16%
Control (n=20)	72.27%	64.45%
PIP-E	1.25	1.19
PIP- C	1.25	1.13



*Table 3: PVQ and PGQ Results*

*The aggregated results of the Value Commitment Questionnaire and the Goal Commitment Questionnaire that was administered to each participant in the experimental group to assess the level of engagement and commitment of the participants to their stated goals and values.*

PVQ (n=21)	Average	PGQ (n=21)	Average
How important is this value to you?	4.71	How important is this goal to you?	4.33
How committed are you to living this value?	4.62	I am committed to making progress toward this goal (in acting consistently to achieve this goal):	4.38
Right now, would you like to improve your progress on this value	4.05	Right now, would you like to improve your progress on this goal?	4.05
In the past 10 weeks, I have been successful in living this value:	3.43	In the last month, I have been this successful in living this goal (in acting consistently to ach...)	3
I value this because:-Other people would be upset with me if these values were not important to me.	2.14	This goal is important to me because:-Somebody else wants me to or thinks I ought to, or because someone else will like it if I do.	1.81
I value this because:-I would feel guilty or ashamed if these values were not important to me.	3.19	This goal is important to me because:-I would feel guilty or ashamed if I didn't make progress towards this goal.	3.52
I value this because:-These values are important to me whether or not others agreed.	4.52	This goal is important to me because:-These goals are important to me, whether or not others agree.	4.1
I value this important to me because:-Living consistently with these values make my life more meaningful and/or more vital.	4.24	This goal is important to me because:-Making progress toward this goal makes my life better, more meaningful and/or more vital.	4.1
I value this because:-I experience fun and enjoyment when I live consistently with these values.	4.19	This goal is important to me because:-I experience fun and enjoyment when I am engaged in progress toward this goal.	3.76

Table 4

*Compiled averages of the pre- and post-tests for both experimental and control groups with changes calculated. The experimental group had a total of 15 respondents, and the control group had a total of 12 respondents.*

Average	Pre-Test	<b>SS-A</b>	DASS	SF-36	<b>AAQ</b>
	Experimental	46.73 <i>(7.85)</i>	11.36 <i>(7.79)</i>	103.18 <i>(14.63)</i>	17.36 <i>(11.51)</i>
	Control	47.8 <i>(9.45)</i>	13.8 <i>(16.09)</i>	93 <i>(26.6)</i>	17.2 <i>(12.93)</i>

Average	Post-Test	<b>SS-A</b>	DASS	SF-36	<b>AAQ</b>
	Experimental	43.57 <i>(8.14)</i>	7 <i>(4.65)</i>	118.14 <i>(11.39)</i>	11.57 <i>(5.88)</i>
	Control	43.55 <i>(7.5)</i>	10.82 <i>(17.05)</i>	119.18 <i>(12.63)</i>	12.64 <i>(8.03)</i>

Average	Pre to Post Change	<b>SS-A</b>	DASS	SF-36	<b>AAQ</b>
	Experimental	-3.16	-4.36	14.96	-5.79
	Control	-4.25	-2.98	26.18	-4.56

*Note: Bold and italicized designates the batteries which are reverse scored.*

Table 5

*Correlation co-efficients of pre-test scores and key measures of the HMR program, specifically weight loss, physical activity and the triple imperative. Bold and italicized designates the batteries which are reverse scored. The experimental group had a total of 15 respondents, and the control group had a total of 12 respondents.*

Experimental	Pre-test	<b>SS-A</b>	DASS	SF-36	<b>AAQ</b>
	Weight	0.58	0.10	-0.25	0.36
	PA	0.15	-0.01	-0.09	0.19
	Triple I	0.12	-0.12	0.05	-0.03

Control	Pre-test	<b>SS-A</b>	DASS	SF-36	<b>AAQ</b>
	Weight	-0.38	0.07	-0.05	-0.03
	PA	0.56	-0.03	0.18	-0.03
	Triple I	0.39	-0.26	0.37	-0.22

Experimental	Post-test	<b>SS-A</b>	DASS	SF-36	<b>AAQ</b>
	Weight	-0.43	-0.25	-0.81	-0.2
	PA	-0.1	-0.12	0.86	-0.15
	Triple I	0.63	0.45	0.5	0.54

Control	Post-test	<b>SS-A</b>	DASS	SF-36	<b>AAQ</b>
	Weight	-0.24	-0.22	-0.19	0.40
	PA	0.31	-0.1	0.38	-0.72
	Triple I	0.25	-0.28	0.49	-0.72

Table 6

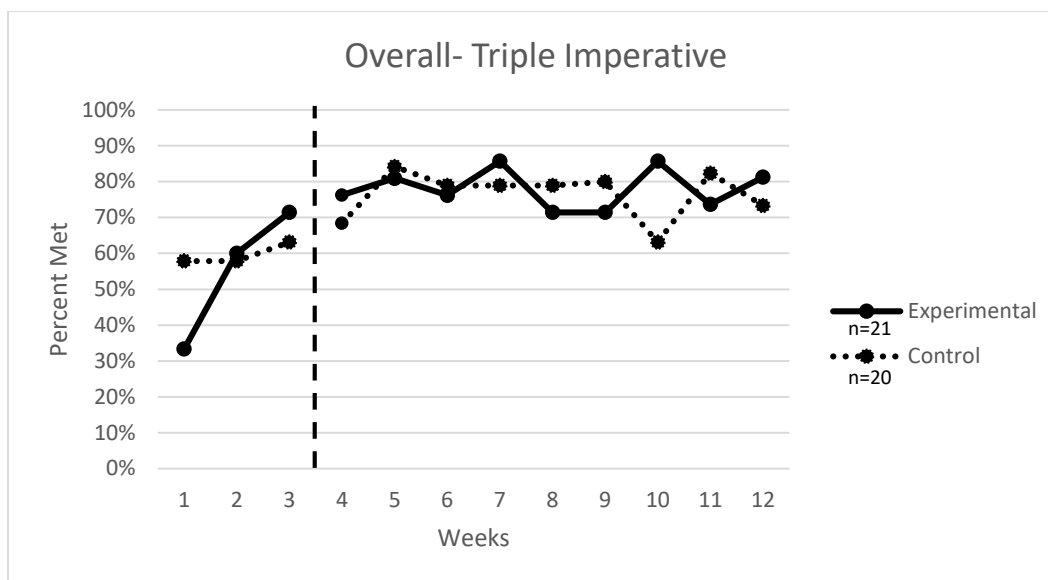
The calculation of the relapse or no weight gain of participants in both the experimental and control group. Included is the calculation of the percentage for each relapse, to adjust for the differences in sample size.

<b>Experimental (n=21)</b>	Weight Gain	No Weight Loss	Both + and 0	At least one instance
Instances	16	16		
%	80%	80%		
# Participants (at least once)	12	14	7	19
%	57%	67%	35%	90%
Average "relapse"	1.33	1.14		
# with NO relapses	9	7		
%	45%	35%		
<hr/>				
<b>Control (n=20)</b>	Weight Gain	No Weight Loss	Both + and 0	At least one instance
Instances	21	21		
%	105%	105%		
# Participants (at least once)	12	14	10	16
%	60%	70%	50%	80%
Average "relapse"	1.75	1.5		
# with NO relapses	8	6		
%	40%	30%		

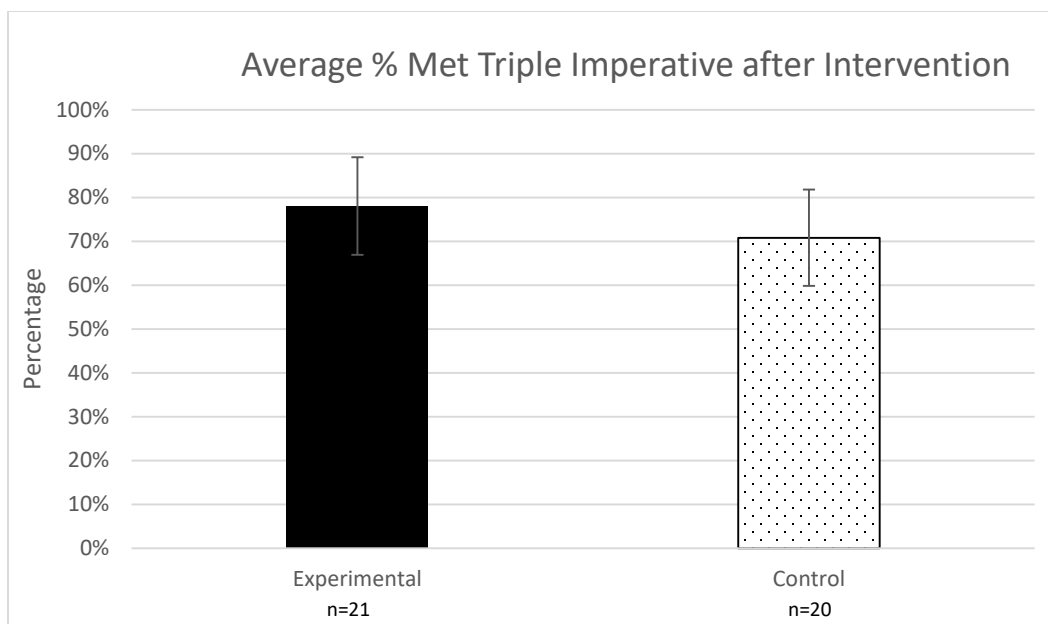
Table 7: The results of the social validity survey administered across both the experimental and control group after they had completed Phase 1 in the HMR program.

Social Validity Question	Experimental (n=8)	Control (n=11)
How satisfied are you with your participation in this study?	2.25	1.36
<b><i>Did you utilize the Goal-Setting Calendar/Planner that was sent to your email?</i></b>	1.75	
<b><i>Did you find the Goal-Setting Calendar/Planner useful in helping you achieve your goals?</i></b>	1.75	
<b><i>Did you utilize the Values Calendar/Planner that was sent to your email?</i></b>	1.88	
<b><i>Did you find the Values Calendar/Planner useful in helping you live in service to your values?</i></b>	1.88	
<b><i>Has participation in this training module impacted you (positively or negatively).</i></b>	1.38	1.09
Participation in this study has helped me make progress toward my health goals.	3.50	
Participation in this study has helped me make live in service with your stated values.	3.43	
<b><i>Would you recommend that HMR continue to use these modules for future classes.</i></b>	1.25	1.09

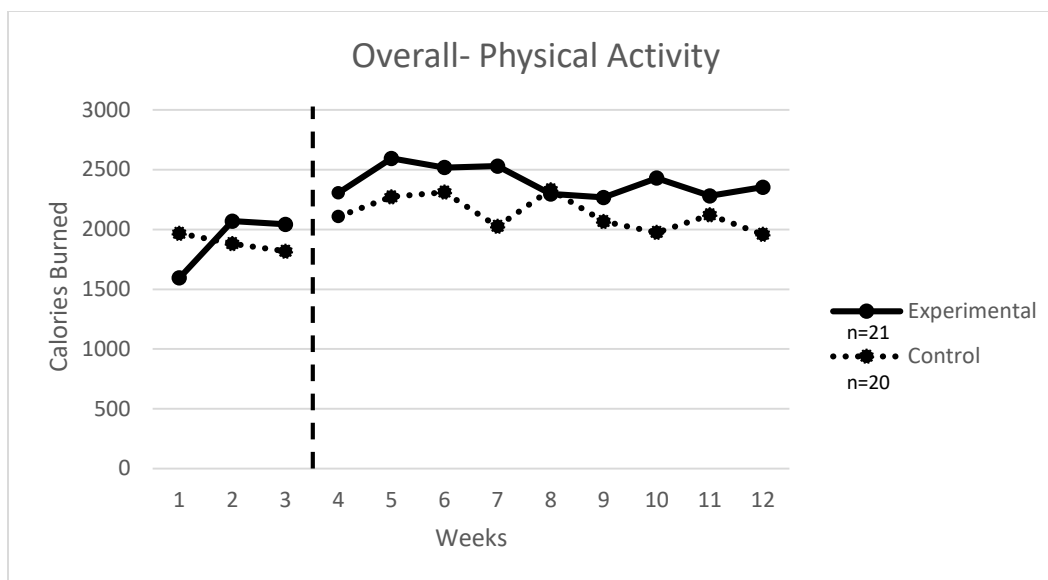
Note: This table represents the average response to questions from both experimental and control groups. The control groups did not receive the value and goal questions that the experimental group did, since they would not be relevant. Also Note: The questions which have been bolded and italicized are Yes/No questions, which were rated on a scale of 1= Yes and 2= No. All other questions were 1-5 Likert scale with 1= Strongly Agree and 5= Strongly Disagree.



*Figure 1: The percentage of participants who successfully achieved the HMR triple imperative each week in both the experimental and control groups.*

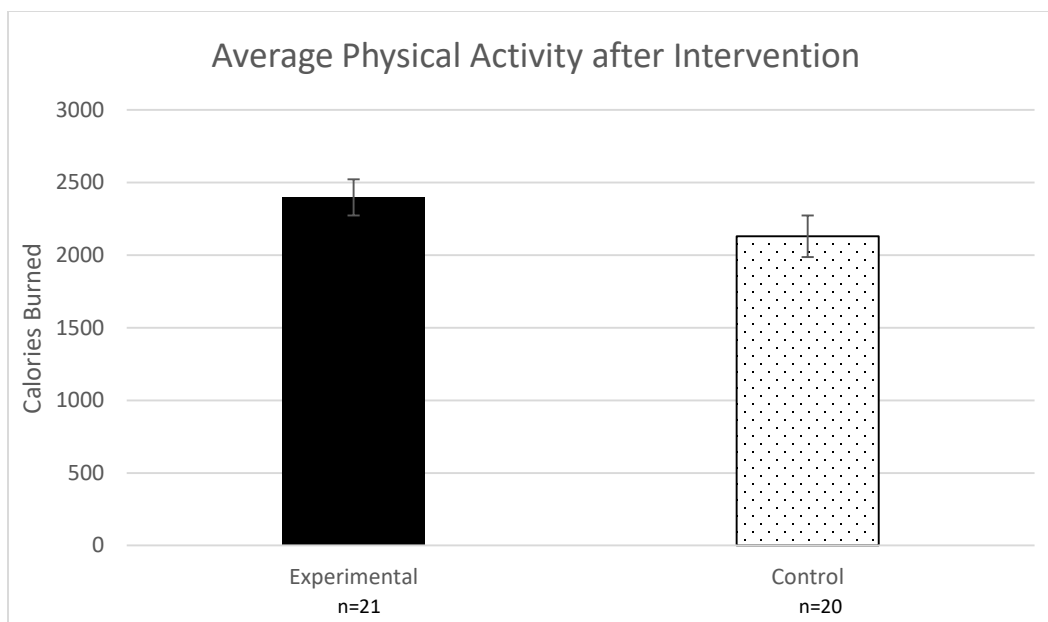


*Figure 2: The average percentage of participants for each group that met the criteria for the triple imperative each week after the intervention. Lines represent the standard deviation calculated for each group over the nine weeks.*



*Figure 3: The average physical activity of participants completed each week by both the experimental and control groups.*





*Figure 4: The average number of calories burned each week through physical activity after the intervention. Lines represent the standard deviation calculated for each group over the nine weeks.*

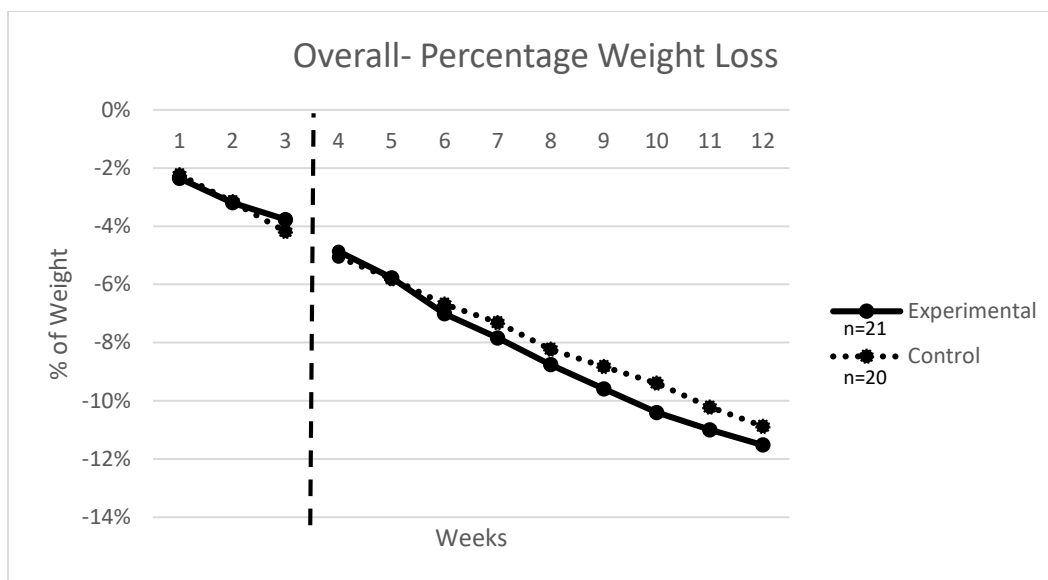
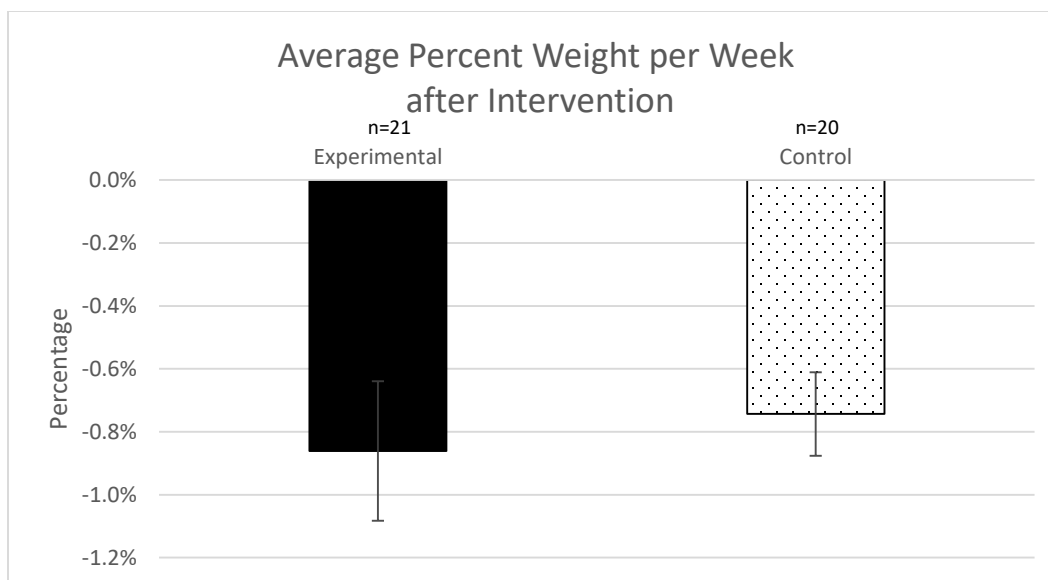


Figure 5: The average percentage of bodyweight lost by participants each week by the experimental and control groups.



*Figure 6: The average percent weight lost each week through physical activity after the intervention. Lines represent the standard deviation calculated for each group over the nine weeks.*

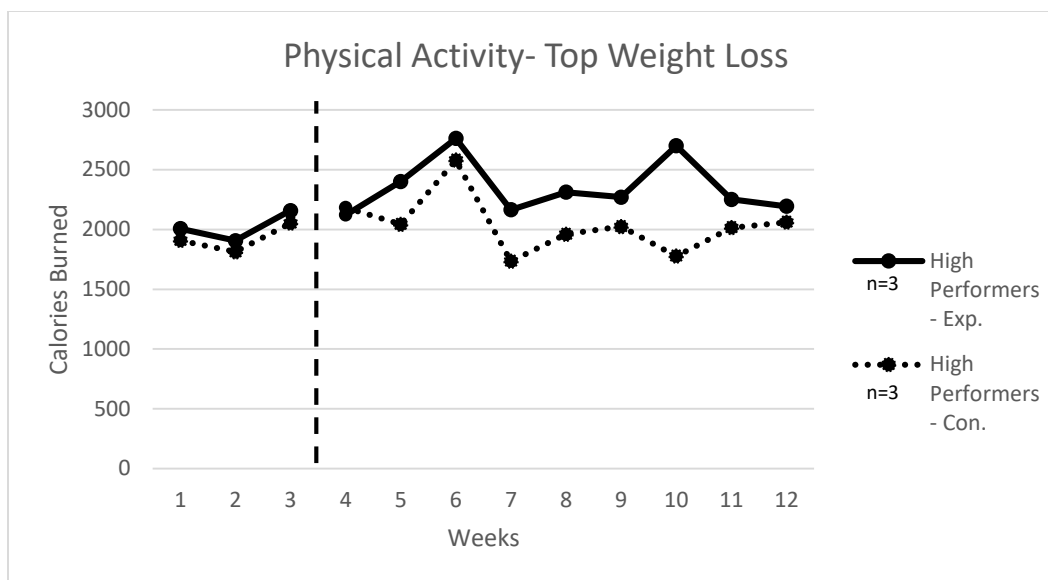
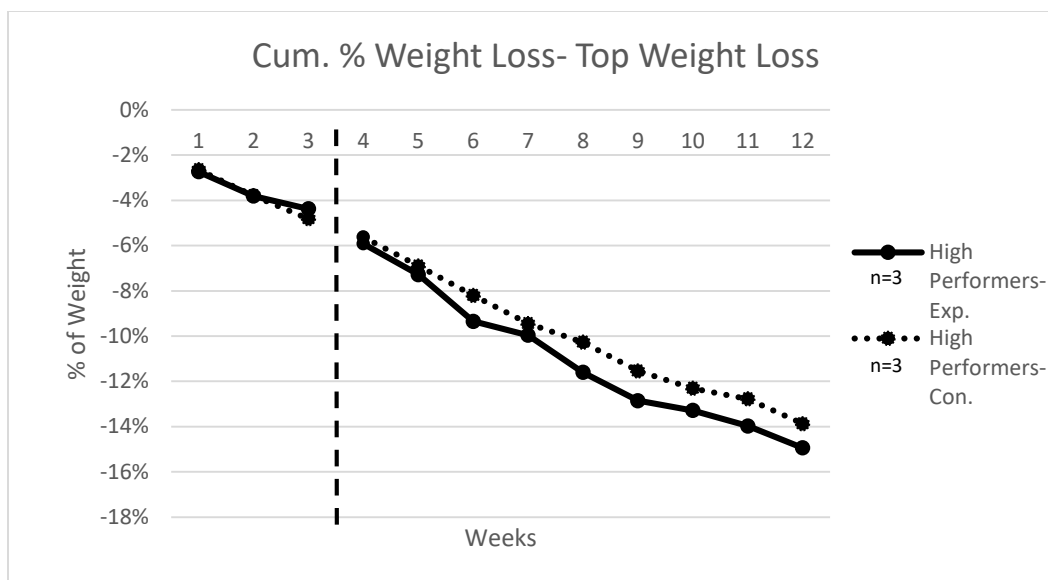
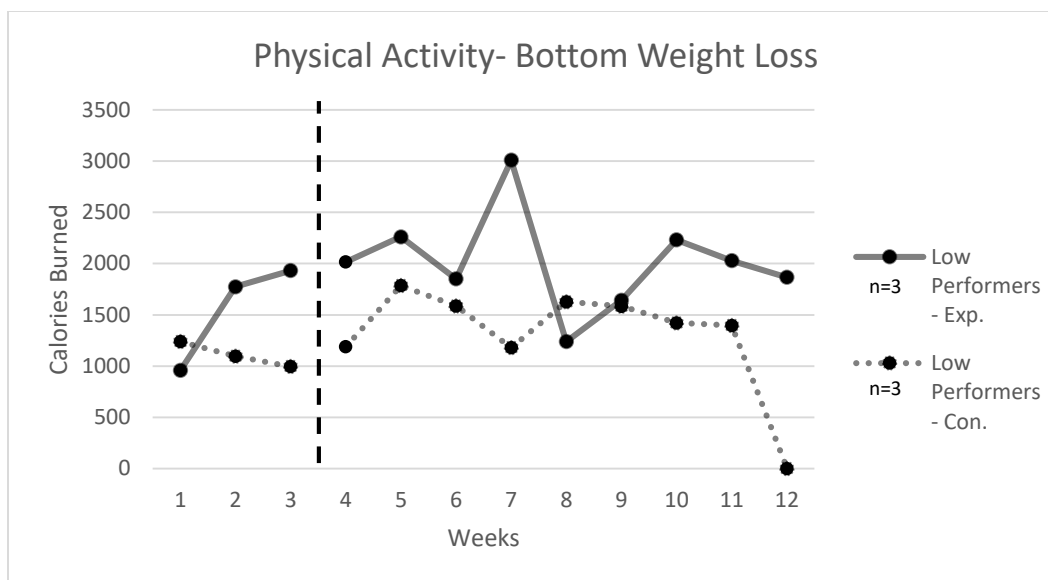


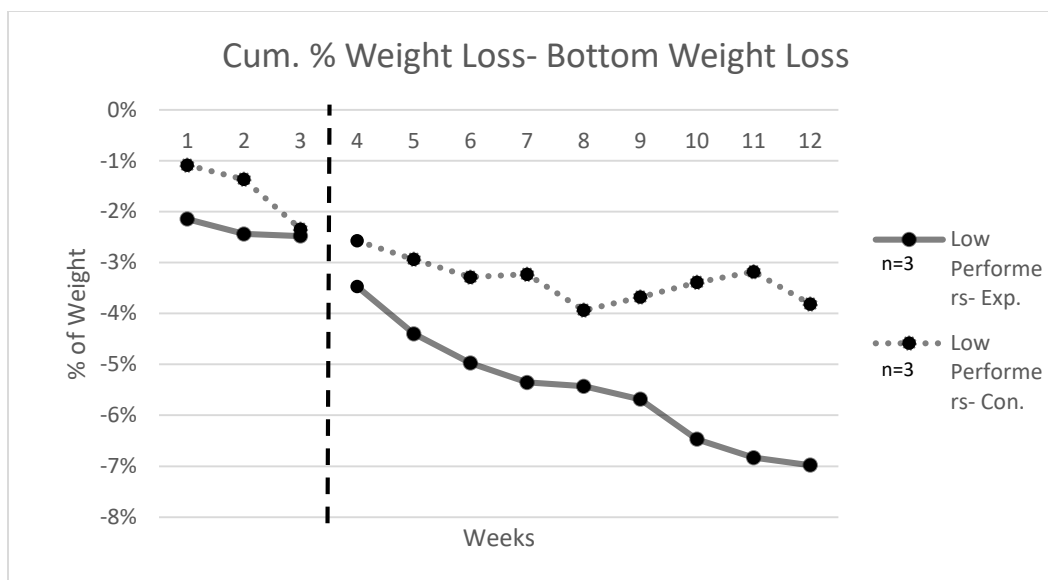
Figure 7: Aggregated physical activity expenditure by week of the participants who were the top 15% in terms of weight loss for the experimental and control groups.



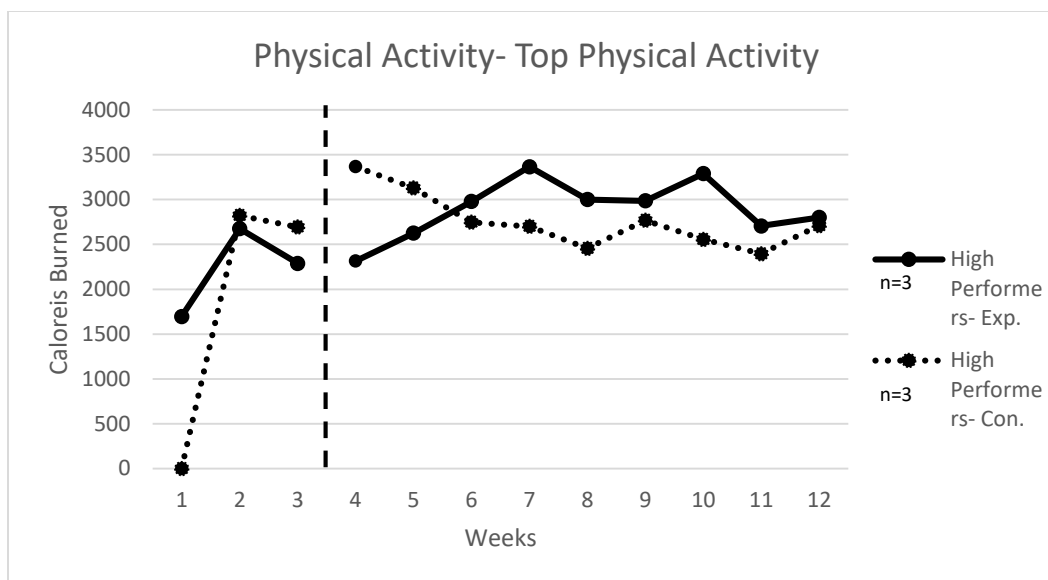
*Figure 8: Aggregated cumulative percent weight by week of the participants who were the top 15% in terms of weight loss for the experimental and control groups.*



*Figure 9: Aggregated physical activity expenditure by week of the participants who were the bottom 15% in terms of weight loss for the experimental and control groups.*



*Figure 10: Aggregated cumulative percent weight by week of the participants who were the bottom 15% in terms of weight loss for the experimental and control groups.*



*Figure 11: Aggregated physical activity expenditure by week of the participants who were the top 15% in terms of physical activity for the experimental and control groups.*



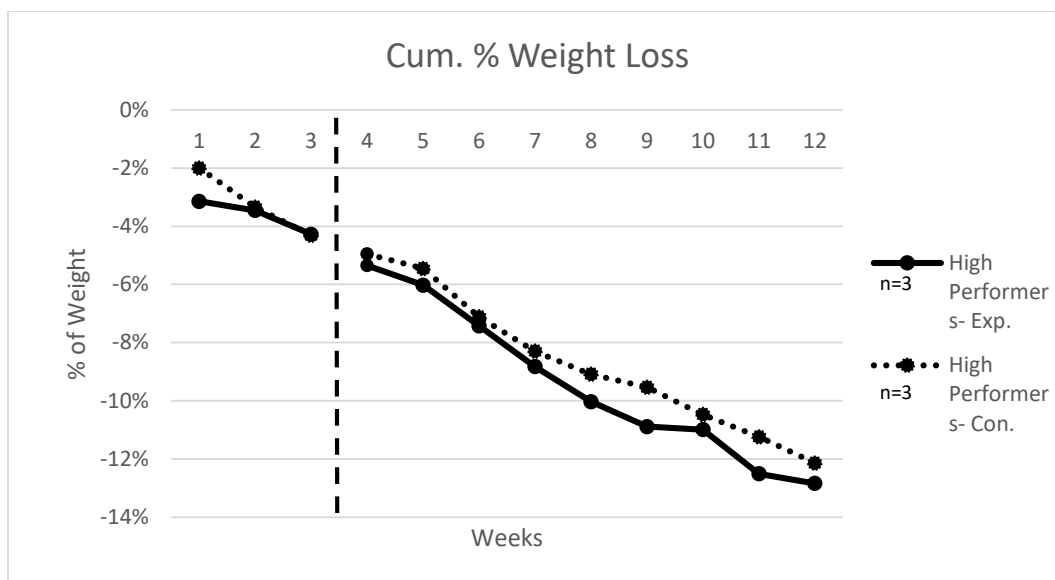
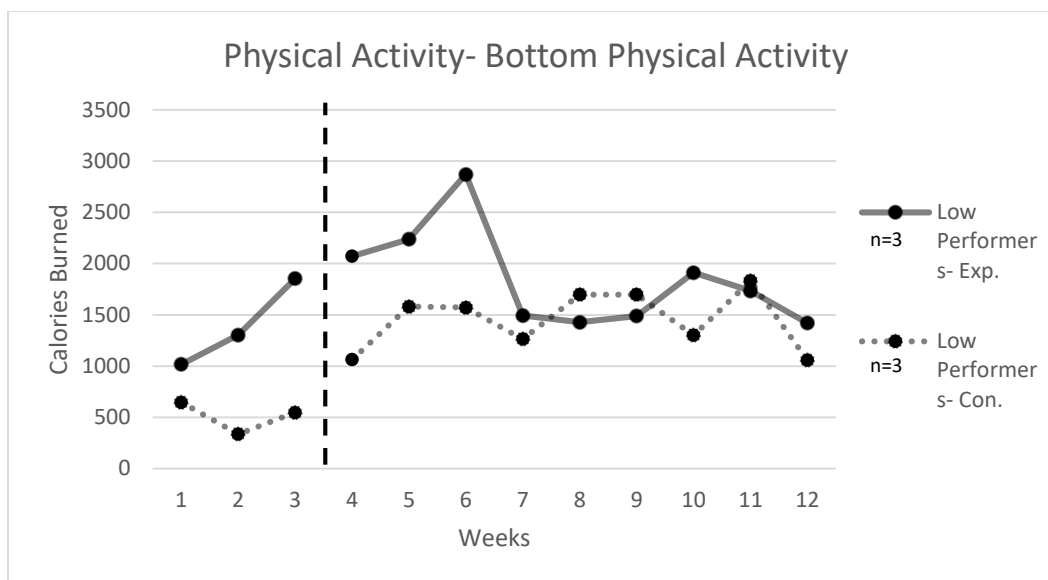
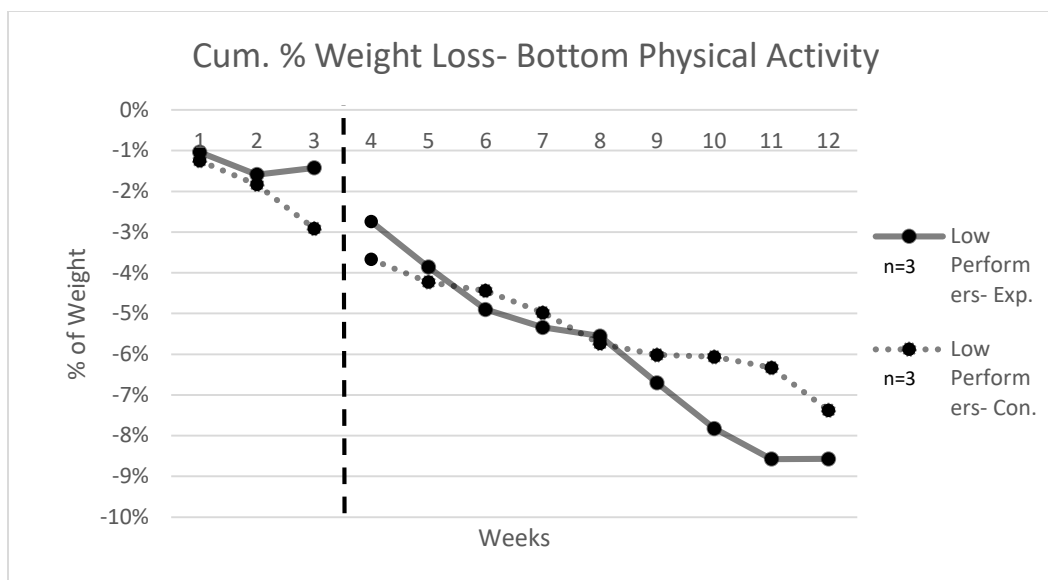


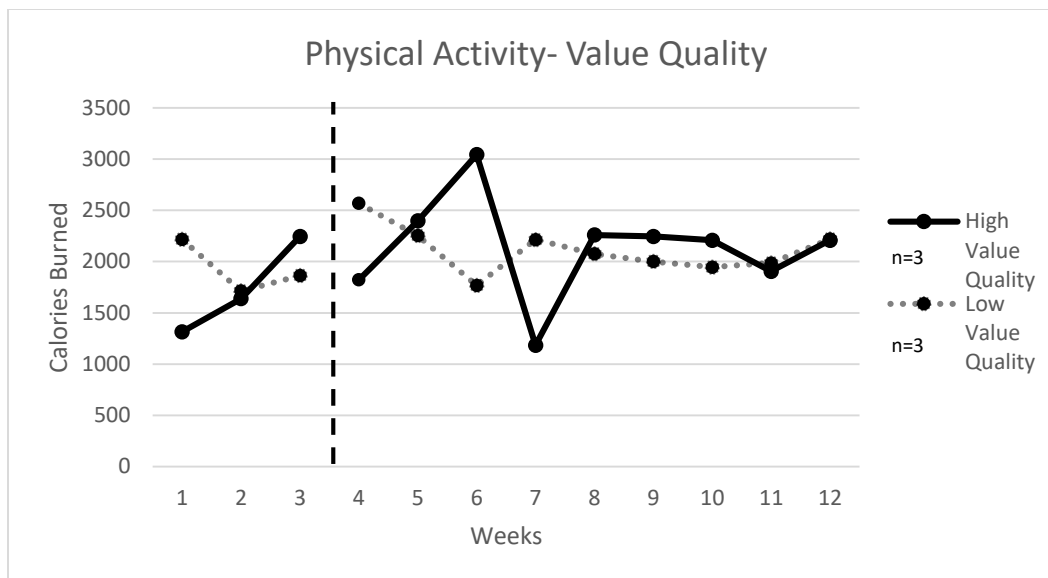
Figure 12: Aggregated cumulative percent weight by week of the participants who were the top 15% in terms of physical activity for the experimental and control groups.



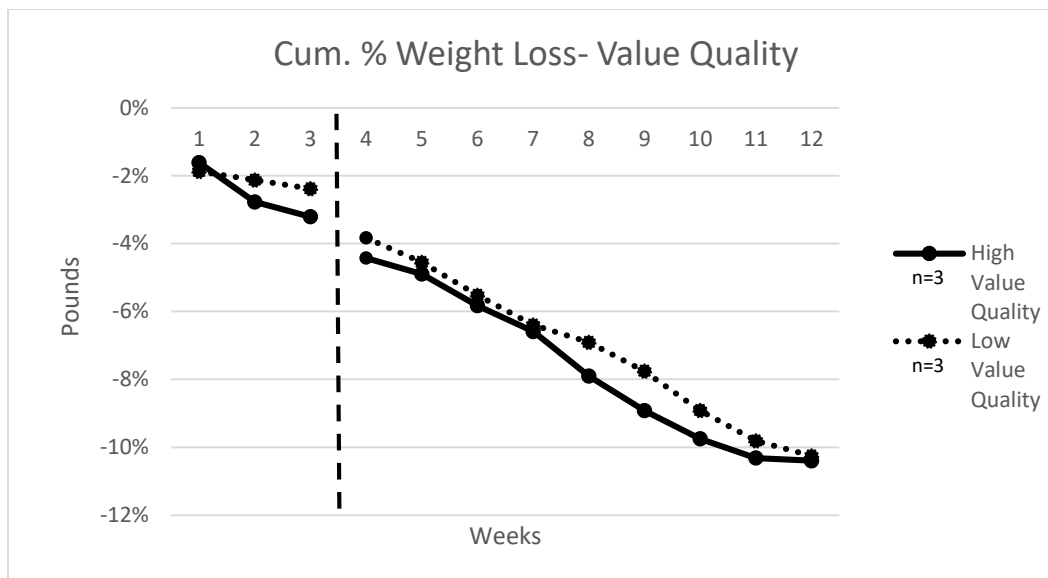
*Figure 13: Aggregated physical activity expenditure by week of the participants who were the bottom 15% in terms of physical activity for the experimental and control groups.*



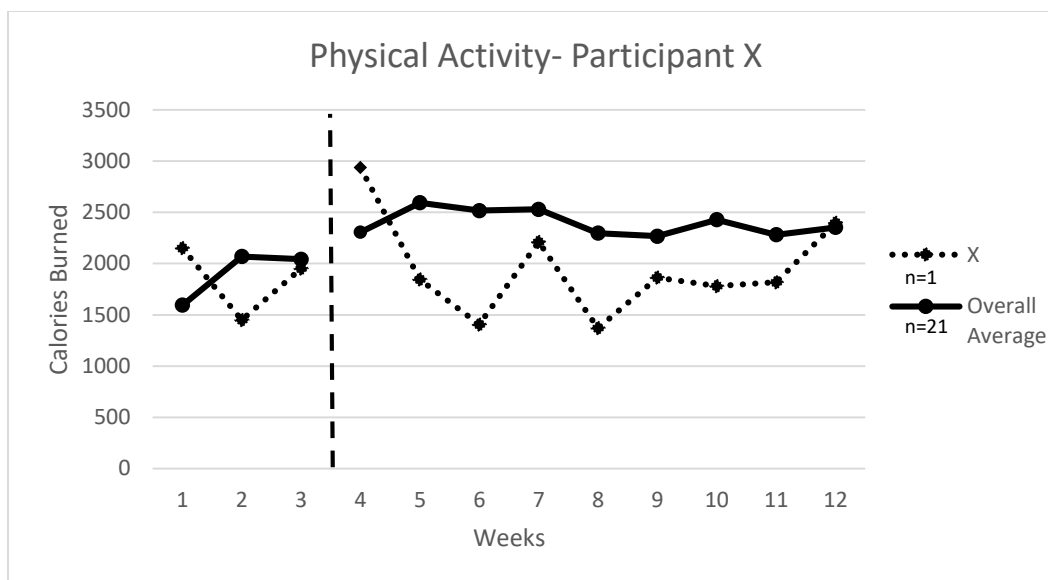
*Figure 14: Aggregated cumulative percent weight by week of the participants who were the bottom 15% in terms of physical activity for the experimental and control groups.*



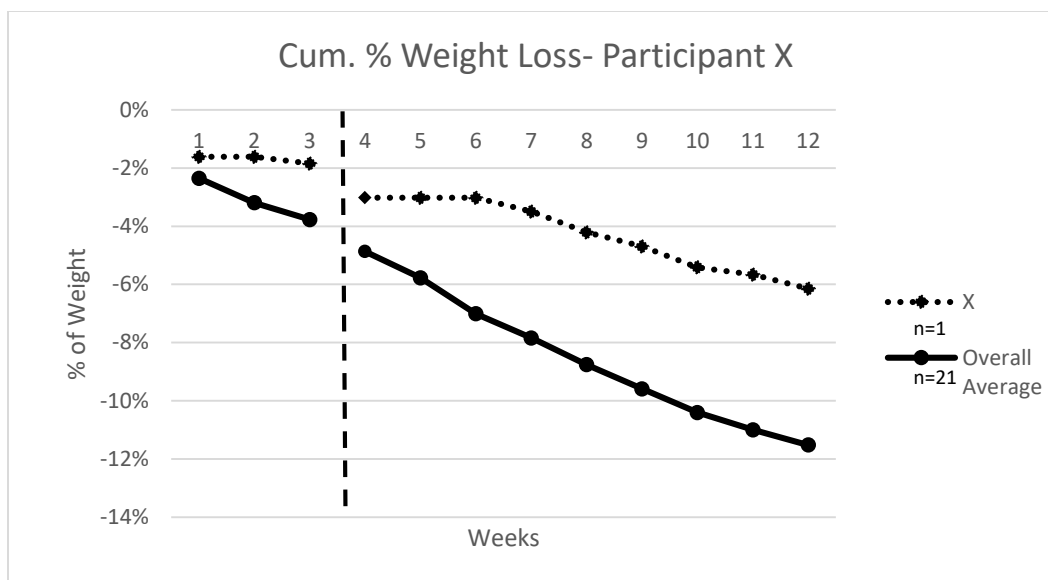
*Figure 15: Aggregated average physical activity of participants in the experimental group who received a high (top 15%) rating generated value statement compared to participants in the experimental group who received a low (bottom 15%) rating of their generated value statement.*



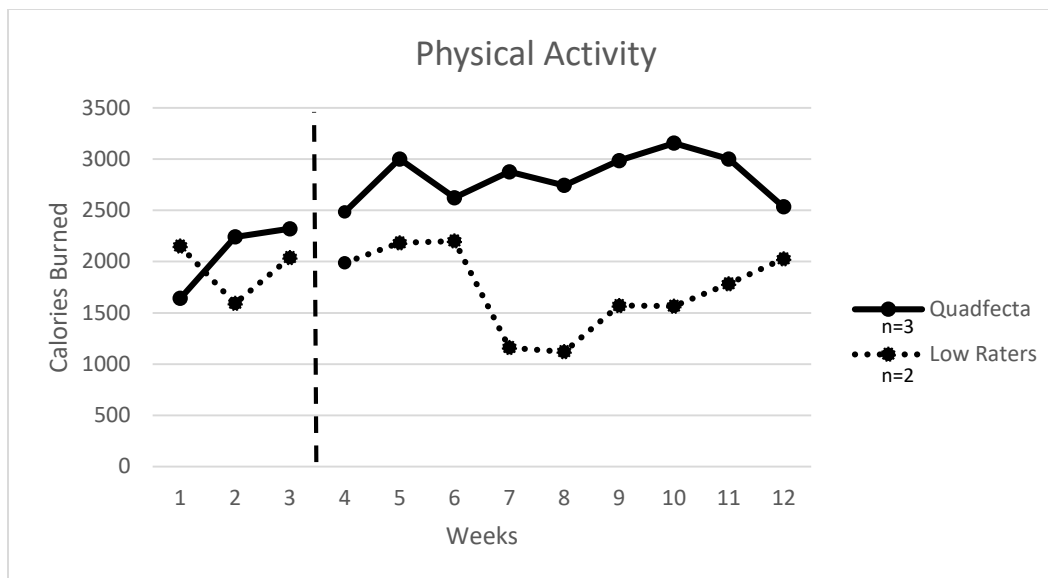
*Figure 16: Aggregated percentage of weight for participants in the experimental group who received a high (top 15%) rating generated value statement compared to participants in the experimental group who received a low (bottom 15%) rating of their generated value statement.*



*Figure 17: Physical activity reported by "Participant X" by week, in comparison to the overall average physical activity reported by participants in the experimental group.*

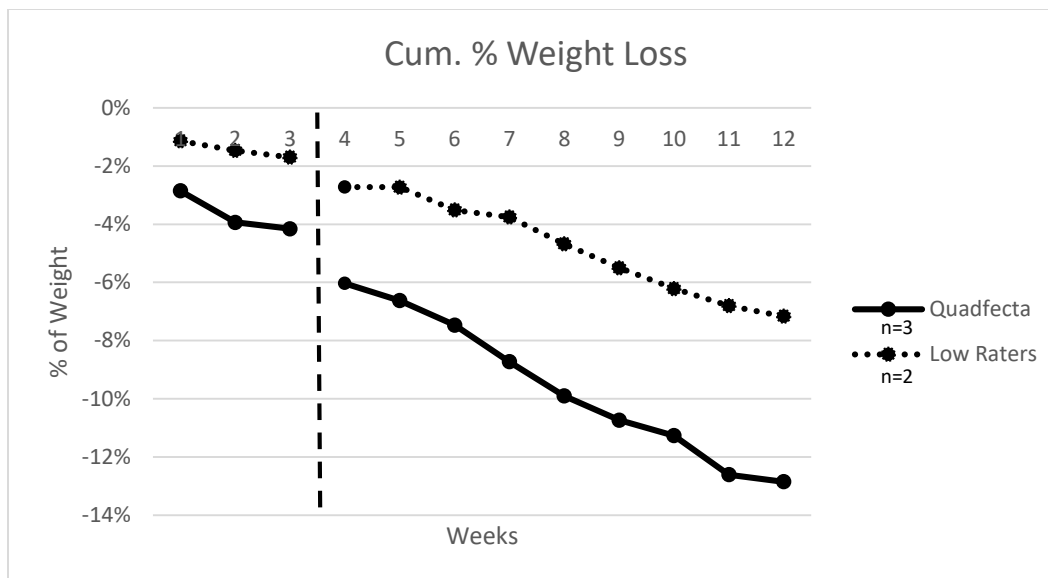


*Figure 18: Percentage of weight reported by “Participant X” by week, in comparison to the overall average physical activity reported by participants in the experimental group who completed their value clarification generation assignment and the goal generation assignment in the experimental module.*



*Figure 19: Aggregate average physical activity of all participants across weeks who achieved the “quadfecta” by rating “importance” and “commitment” to their values as a 5 and included a reference to physical activity in both their goal statement and value statement. They are compared to participants who rated the “importance” and “commitment” to their value as a 3 or below.*





*Figure 20: Aggregate average percentage of weight of all participants across weeks who achieved the “quadfecta” by rating “importance” and “commitment” to their values as a 5 and included a reference to physical activity in both their goal statement and value statement. They are compared to the average percentage of weight for participants who rated the “importance” and “commitment” to their value as a 3 or below.*

## Appendix A

### DASS

Please read each statement and circle a number 0, 1, 2 or 3 that indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement.

*The rating scale is as follows:*

- 0 Did not apply to me at all
- 1 Applied to me to some degree, or some of the time
- 2 Applied to me to a considerable degree, or a good part of time
- 3 Applied to me very much, or most of the time

1	I found it hard to wind down	0	1	2	3
2	I was aware of dryness of my mouth	0	1	2	3
3	I couldn't seem to experience any positive feeling at all	0	1	2	3
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5	I found it difficult to work up the initiative to do things	0	1	2	3
6	I tended to over-react to situations	0	1	2	3
7	I experienced trembling (eg, in the hands)	0	1	2	3
8	I felt that I was using a lot of nervous energy	0	1	2	3
9	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10	I felt that I had nothing to look forward to	0	1	2	3
11	I found myself getting agitated	0	1	2	3
12	I found it difficult to relax	0	1	2	3
13	I felt down-hearted and blue	0	1	2	3
14	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15	I felt I was close to panic	0	1	2	3
16	I was unable to become enthusiastic about anything	0	1	2	3
17	I felt I wasn't worth much as a person	0	1	2	3

18	I felt that I was rather touchy	0	1	2	3
19	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3
20	I felt scared without any good reason	0	1	2	3
21	I felt that life was meaningless	0	1	2	3

\*Note: Content from Lovibond & Lovibond (1995).

## Appendix B

Below you will find a list of statements. Please rate how true each statement is for you by circling a number next to it. Use the scale below to make your choice.

1	2	3	4	5	6	7
never true	very seldom true	seldom true	sometimes true	frequently true	almost always true	always true

1. My painful experiences and memories make it difficult for me to live a life that I would value.	1	2	3	4	5	6	7
2. I'm afraid of my feelings.	1	2	3	4	5	6	7
3. I worry about not being able to control my worries and feelings.	1	2	3	4	5	6	7
4. My painful memories prevent me from having a fulfilling life.	1	2	3	4	5	6	7
5. Emotions cause problems in my life.	1	2	3	4	5	6	7
6. It seems like most people are handling their lives better than I am.	1	2	3	4	5	6	7
7. Worries get in the way of my success.	1	2	3	4	5	6	7

\*Note: Content from Hayes, Masuda, Bissett, & Guerrero (2004).

## Appendix C

## SF-36

For each statement, select the best answer for you. Read the instructions for each question carefully, as the scale for responses change.

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

Excellent      Very Good      Good      Fair      Poor

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

Much better      Somewhat better      About the Same      Somewhat worse      Much worse

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

	Yes, Limited a lot	Yes, Limited a little	No, Not limited at all
Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports	1	2	3
Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling or playing golf	1	2	3
Lifting or carrying groceries	1	2	3
Climbing <i>several</i> flights of stairs	1	2	3
Climbing <i>one</i> flight of stairs	1	2	3
Bending, kneeling, or stooping	1	2	3
Walking <i>more than a mile</i>	1	2	3
Walking <i>several blocks</i>	1	2	3
Walking <i>one block</i>	1	2	3
Bathing or dressing yourself	1	2	3

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

Cut down the <i>amount of time</i> you spent on work or other activities	Yes	No
<i>Accomplished less</i> than you would have liked	Yes	No
Were limited in the <i>kind</i> of work or other activities	Yes	No
Had <i>difficulty</i> performing the work or other activities (for example, it took extra effort)	Yes	No

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

Cut down the <i>amount of time</i> you spent on work or other activities	Yes	No
<i>Accomplished less</i> than you would have liked	Yes	No
Didn't do work or other activities <i>as carefully</i> as usual	Yes	No

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

Not at all      Slightly      Moderately      Quite a bit      Extremely

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

None      Very mild      Mild      Moderate      Severe      Very Severe

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

Not at all      A little bit      Moderately      Quite a bit      Extremely

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

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

Did you feel tired?                    1                    2                    3                    4                    5                    6

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

All of the time                    Most of the time                    Some of the time                    A little of the time                    None of the time

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

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

\*Note: Content from Doll, Peterson & Stewart-Brown (2000).



## Appendix D

### SS-A

Below are a list of statements about your relationship with family and friends. Please indicate how much you agree or disagree with each statement as being true.

*The rating scale is as follows:*

- 1 Strongly Agree
- 2 Agree
- 3 Disagree
- 4 Strongly Disagree

1	My friends respect me	1	2	3	4
2	My family cares for me very much	1	2	3	4
3	I am not important to others	1	2	3	4
4	My family holds me in high esteem	1	2	3	4
5	I am well liked	1	2	3	4
6	I can rely on my friends	1	2	3	4
7	I am really admired by my family	1	2	3	4
8	I am respected by other people	1	2	3	4
9	I am loved dearly by my family	1	2	3	4
10	My friend's don't care about my welfare	1	2	3	4
11	Members of my family rely on me	1	2	3	4
12	I am held in high esteem	1	2	3	4
13	I can't rely on my family for support	1	2	3	4
14	People admire me	1	2	3	4
15	I feel a strong bond with my friends	1	2	3	4
16	My friends look out for me	1	2	3	4
17	I feel valued by other people	1	2	3	4
18	My family really respects me	1	2	3	4
19	My friends and I are really important to each other	1	2	3	4

20	I feel like I belong	1	2	3	4
21	If I died tomorrow, very few people would miss me	1	2	3	4
22	I don't feel close to members of my family	1	2	3	4
23	My friends and I have done a lot for one another	1	2	3	4

\*Note: Content from Wing & Jeffery, 1999.

## Appendix E

### Personal Values Questionnaire (PVQ)

#### Personal Value: Health/Physical Well-Being

What kind of person would you most like to be with respect to your personal health? What kinds of things do you value about being healthy? What qualities do you value regarding what you eat and your physical abilities? For example, some people value being active, eating healthy foods, or exercising regularly. Some people value feeling healthier and being able to participate in activities with loved-ones

Regardless of what others want, you should write down *you* really value when it comes to your health and/or qualities you find important demonstrating as a healthy individual-- you should decide for yourself what kind of person you value being with respect to your personal health and physical well-being.

Please write down your Health/Physical Well-Being values here:

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Please answer the following questions by circling the number (on the right) that is true for you:

1. How important is this value to you?	1 Not at all important	2 A little bit important	3 Moderately important	4 Quite important	5 Extremely important
2. How committed are you to living this value?	1 Not at all committed	2 Slightly committed	3 Moderately committed	4 Quite committed	5 Extremely committed
3. Right now, would you like to improve your progress on this value?	1 Not at all	2 A little bit	3 Moderately so	4 Quite a bit	5 Extremely so
4. In the last 10 weeks, I have been this successful in living this value:	1 0-20% Successful	2 21-40% Successful	3 41-60% Successful	4 61-80% Successful	5 81-100% Successful

5. I value this because:

a. Other people would be upset with me if these values were not important to me.	1 Strongly Disagree	2 Moderately Disagree	3 Neither Disagree nor Agree	4 Moderately Agree	5 Strongly Agree
b. I would feel guilty or ashamed if these values were not important to me.	1 Strongly Disagree	2 Moderately Disagree	3 Neither Disagree nor Agree	4 Moderately Agree	5 Strongly Agree
c. These values are important to me, whether or not others agree	1 Strongly Disagree	2 Moderately Disagree	3 Neither Disagree nor Agree	4 Moderately Agree	5 Strongly Agree
d. Living consistently with these values makes my life more meaningful	1 Strongly Disagree	2 Moderately Disagree	3 Neither Disagree nor Agree	4 Moderately Agree	5 Strongly Agree
e. I experience fun and enjoyment when I live consistently with these values.	1 Strongly Disagree	2 Moderately Disagree	3 Neither Disagree nor Agree	4 Moderately Agree	5 Strongly Agree

\*Note: Content from Blackledge & Ciarrochi, (2006). As used in Chase, et. al. (2013).

## Appendix F

### Personal Goals Questionnaire (PGQ)

#### Personal Goal: Health/Physical Well-Being

What kind of person would you most like to be with respect to your personal health? What kinds of things do you find important about being healthy? What qualities do you find important about what you eat and your physical abilities? For example, some people value being active, eating healthy foods, or exercising regularly. Some people enjoy feeling healthier and being able to participate in activities with loved-ones

Regardless of what others want, you should write down *your* goals for health and/or qualities you find important demonstrating as a healthy individual.

**Please write down your Health/Physical Well-Being goals here:**

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**Please answer the following questions by circling the number (on the right) that is true for you:**

1. How important is this goal to you?	1 Not at all important	2 A little bit important	3 Moderately important	4 Quite important	5 Extremely important
2. I am this committed to making this progress toward this goal (in acting consistently to achieve this goal):	1 Not at all committed	2 Slightly committed	3 Moderately committed	4 Quite committed	5 Extremely committed
3. Right now, would you like to improve your progress on this goal?	1 Not at all	2 A little bit	3 Moderately so	4 Quite a bit	5 Extremely so
4. In the last month, I have been this successful in living this goal (in acting consistently to achieve this goal):	1 0-20% Successful	2 21-40% Successful	3 41-60% Successful	4 61-80% Successful	5 81-100% Successful

5. This goal is important to me because:

a. Somebody else wants me to or thinks I ought to, or because someone else will like it if I do.	1 Strongly Disagree	2 Moderately Disagree	3 Neither Disagree nor Agree	4 Moderately Agree	5 Strongly Agree
b. I would feel guilty or ashamed if I didn't make progress towards this goal	1 Strongly Disagree	2 Moderately Disagree	3 Neither Disagree nor Agree	4 Moderately Agree	5 Strongly Agree
c. These goals are important to me, whether or not others agree.	1 Strongly Disagree	2 Moderately Disagree	3 Neither Disagree nor Agree	4 Moderately Agree	5 Strongly Agree
d. Making progress toward this goal makes my life better, more meaningful and /or more vital.	1 Strongly Disagree	2 Moderately Disagree	3 Neither Disagree nor Agree	4 Moderately Agree	5 Strongly Agree
e. I experience fun and enjoyment when I am engaged in progress toward this goal.	1 Strongly Disagree	2 Moderately Disagree	3 Neither Disagree nor Agree	4 Moderately Agree	5 Strongly Agree

\*Note: Adapted from Blackledge & Ciarrochi (2006). As used in Chase, et. al. (2013).

Appendix G  
Social Validity Survey

1. How satisfied are you with your participation in this study?

1	2	3	4	5
Extremely Dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely Satisfied

2. Did you utilize the Goal-Setting Calendar/Planner from Part II of this study?

1	2
Yes	No

2a. Did you find the Goal-Setting Calendar/Planner useful in helping you achieve your goal(s)? (\*If they answered yes to #2\*)

1	2	3
Yes	No	N/A- I did not use the goal-setting calendar/planner

3. Did you utilize the Values Calendar/Planner from Part II of this study?

1	2	3
Yes	No	N/A- I did not use the values calendar/planner

3a. Did you find the Values Calendar/Planner useful in helping you live in service of your health value(s)? (\*If the answered yes to #3\*)

1	2
Yes	No

4. Has participation in this training module impacted you (positively or negatively) other areas in your life?

1	2
Yes	No

5. Participation in this study has helped me make progress toward my health goal(s)?

1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree

5. Participation in this study has helped me make live in service with your stated health value(s)?

1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree

6. Would you recommend that HMR continue to use these modules for future classes?

1  
Yes

2  
No

7. General comments about your experiences in this study:



## Appendix H

## Value Quality Coding

Value Quality					
Rating Category	1	2	3	4	5
Sentence Structure/Grammar	Major mistakes to the point that the rater cannot understand what the participant is writing.	Many mistakes. Rater must make some assumptions to determine what the participant is writing.	Some noticeable mistakes but rater can understand what the participant is writing.	Minor mistakes, but the rater can easily understand what the participant is writing about.	No grammatical errors.
Face Validity	Participant's statement does not qualify as a value statement or respond to the question(s).	Participant states a value that is not related to health.	Participant states a value that is indirectly related to health (ease back pain) OR is directly related to health but is not expressly stated (I want to feel better in my own skin).	Participant expressly states a value pertaining to weightloss, food consumption, or anything else directly related to health but not specific to HMR (e.g. does not use the HMR terms).	Participant expressly states a value directly pertaining to their health and HMR, utilizing HMR terminology.