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Guided-Imagery Meditation as an Adjunct to Weight Management

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Abstract

Objective: To assess the utility of guided imagery meditation (GIM) as a low-invasive, cost-effective modality to weight management. Researchers hypothesized that using a standardized, lifestyle-focused GIM would result in weight loss and waist circumference (WC) changes.

Design: Researchers designed a 12-week randomized, controlled pilot study in which participants were asked to use a provided GIM.

Setting: Comfort and relaxation are crucial for GIM. The study, therefore, utilized participants' personal environments.

Participants: Convenient sampling of 82 students, faculty, and staff of the University of the Pacific.

Intervention(s): Intervention group participants were provided with a researcher-designed, lifestyle-focused GIM and asked to meditate daily. All participants received weekly emails with nutrition education/resources.

Main Outcome Masure(s): Changes to weight and WC were tracked for 12 weeks with BMI as a secondary measure.

Analysis: Correlation and regression analysis was conducted.

Results: Linear regression analysis suggests that the number of meditations may be predictive of the amount of weight loss (p=0.055). Demographic factors (age, race, marital status) are statistically significant predictors of weight and WC changes.

Conclusions and Implications: This pilot study is the first to implement a researcher-designed lifestyle-focused GIM and found that GIM should be considered as a low-invasive, cost-effective adjunct to weight management.

Keywords

obesity, overweight, guided imagery meditation, mindfulness, weight management

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1. INTRODUCTION

Obesity and overweight (O/O) are complex yet sensitive societal issues. With nearly 75% of the US adult population classified as O/O [1], weight management is becoming a significant public health concern. Excessive weight is implicated in nearly half a million excess deaths per year in the United States alone [2]. The personal and societal risks and consequences of O/O are multifaceted, and span political, socioeconomic, and healthcare arenas. Research suggests that O/O is linked to the development of diabetes [3], hypertension [4] and other cardiovascular diseases [5], pulmonary conditions such as asthma and sleep apnea [6], and certain types of cancers such as colorectal, pancreatic, and liver cancer [7, 8]. The effects of O/O on morbidity and mortality are compounded by their financial ramifications. Depending on reports, estimated annual medical costs amount to upwards of $170 billion [9] to as high as $260 billion [10], not accounting for productivity and wage losses, disability, quality of life implications, or mental health consequences, to name a few. The question remains to what extent our current healthcare system has contributed to the staggering rise in O/O over the past few decades. At the very least, it has failed to ameliorate the situation, leaving patients exposed to a vicious cycle of shame, blame, and repeated gain.

While O/O management should maintain their focus on prevention, interventions are becoming increasingly more critical, particularly as world-wide obesity rates have almost tripled since 1975 [11]. Despite expert consensus on lifestyle-predominant interventions [12], patients are often guided toward or elect more expensive, invasive, or trendy interventions, such as bariatric surgery, medications, weight loss devices, or special diets. However, accessibility to, as well as cost, effectiveness, and quality of treatment options can present significant barriers for patients, and as such contribute to the reported failure rates of O/O treatments [13,14,15,16,17]. For

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instance, psychoemotional, genetic, anatomophysiological, and dietary factors are implicated in post-bariatric surgery weight regain [14]. Special weight loss diets, such as the ketogenic/low carbohydrate diet, often fall short due to difficulties with long-term adherence or consistent lifestyle integration [18,19].

Conversely, less-invasive and low-cost options for weight management, such as mindfullness, tend to be under-researched, -appreciated, and -utilized. While mindfulness-based interventions have shown promising short-term results on stress and weight reduction [20,21], few quality long-term studies exist. Likewise, meditation (as one aspect of mindfulness) appears to have positive correlations with mood, quality of life, and sleep [22]. However, a systematic review of the evidence-based literature revealed a significant gap in publications on meditation and weight management [23]. The few existing randomized controlled trials using meditation as a weight reduction intervention demonstrated significant weight loss in the intervention compared to the control groups [24,25]. While promising, these studies demonstrate several limitations. For instance, the small sample size and short study duration (less than 12 weeks) likely skewed the data. Also, researchers neither controlled the type, length, and frequency of meditations nor accounted for contributing factors such as participants' medical histories. This, in conjunction with the scarcity in literature, led authors to design a randomized, single-blinded pilot study to implement their innovative idea of creating and recording a nutrition-focused guided-imagery-meditation (GIM) to systematize a low-invasive, low-cost intervention for weight management. GIM is an evidence-based intervention promoting the relaxation for the mind and body, and includes elements such as focused breathing, visualizing positive images regarding the environment, and a relaxed body position [26, 27]. Researchers hypothesized that daily use of a standardized GIM results in significant weight loss and waist circumference (WC) reduction.

2. METHODS and Materials

After institutional review board (IRB) approval, study participants were recruited in April 2022 from the University of the Pacific's School of Health Sciences adult students, staff, faculty, and administration. The pilot study's convenient sampling allowed for easy and quick access to research participants. 176 individuals applied for participation in the study. Informed consent was obtained from 149 applicants, who were subsequently screened based on inclusion and exclusion criteria. Applicants were excluded for age younger than 18; BMI of less than 25 at time of screening (calculated from self-reported height and weight), significant comorbidities such as diabetes, hypertension, cancer, or eating disorders, current use of weight loss medications, history of bariatric surgery, or current meditation practice more than once weekly. A total of 82 adults were included in the study, randomized, and blinded into intervention (n=41) and control groups (n=41). Groups were largely similar in demographic characteristics. (*Figure 1 below details the demographic distribution of the intervention and control groups.)*

With the assistance of a licensed marriage and family therapist and certified hypnotherapist, authors developed and recorded a 25 min GIM. The GIM included lifestyle messages such as shopping and preparing fresh, nutritious foods, mindful eating practices, and deliberate physical activity. The framework for the creation of the GIM script included imagining a special place (kitchen), body sensations and sensory descriptors, cognitive processes, and emotions regarding food and food types with the goal of establishing a positive environment to enhance behavior change related to the personal relationship with food [28]. Using the present tense, the steps for writing the guided imagery script followed recommendations by Tebbetts [29], starting with an introduction providing structure and a rationale, followed by induction techniques, imagery (staircase), and deepening techniques (repetition). Positive suggestions and affirmations were

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included. Participants were given time to imagine sitting at their kitchen table and tasting homemade nutritious food. The awakening technique involved participants imagining closing the door behind them to shelter the positive environment created in their minds, and slowly ascending the staircase.

Authors also recorded short video instructions on weight and waist circumference (WC) measuring techniques. Each participant received a copy of the Academy of Nutrition and Dietetics' *Complete Food & Nutrition Guide* by Roberta Duyff, a weight scale, a measuring tape, access to the video instructions on how to properly take and record their weight and WC, as well as weekly emails with lifestyle messages and resources from the provided nutrition book. Intervention group participants were in addition provided with the GIM recording.

All participants were asked to self-report their weight weekly for 12 weeks and provide their waist circumferences at the beginning (week 1) and conclusion (week 12) of the study. Only intervention group participants were asked to meditate at least 5 days per week and self-report the number of meditation sessions weekly. At the conclusion of the study, all participants who consistently reported their numbers were entered into a raffle for three $100 grocery gift cards.

2.1 Statistical Analyses

Participant's responses were collected via Wufoo© forms, de-identified, and stored on a secure password-protected platform. Only principal investigators had access to Wufoo data. Wufoo entries were deleted after de-identification. The de-identified data was used for analysis in MS Excel© and R-Studio©. A total of 74 data sets were included in the analysis ($n_{control}$=37, $n_{intervention}$=37). Five data sets were excluded for failure to report data for more than two consecutive weeks. One outlier data set was excluded for likely erroneous reporting of an unrealistic weight loss of 80 pounds in four weeks. Data from two participants was removed from the analysis for failure to provide end point (week 12) data at the conclusion of the study. Preliminary and demographic data analysis was conducted in MS Excel©. Statistical comparison, correlation, and regression analysis was completed with version 4.2.1 R©, a statistical computing and graphics software by a data analytics specialist. Statistical significance was set at a p-value of 0.05.

3. **RESULTS**

Both intervention and control group participants lost weight during the 12-week pilot. This phenomenon has been well documented in other weight loss (WL) studies [30]. On average, participants in the intervention group lost 5.6 lbs and 5.9 cm (2.3 in) in WC and utilized the GIM 2.9 days per week. Self-identified male participants lost more weight than self-identified females, others, or those who preferred not to disclose their gender. Self-identified females meditated more than other participants. Control group participants lost an average of 3.8 lbs and 5.4 cm (2.1 in) in WC. *(Figure 2 shows the average weight loss differences amongst intervention and control group.)*

3.1 Weight and Waist Circumference Differences between Groups

For statistical comparison, the Mann Whitney U test was employed to determine statistical significance between groups. This test was chosen given the lack of normality within the response variables and small sample sizes within each group. While the meditation group lost more weight on average over the 12-week period than the control group, Mann Whitney U testing showed no statistical significance in weight difference between groups (p=0.30). A similar analysis was conducted to determine whether there was a significant difference in WC between the control and intervention groups. While the meditation group experienced a greater reduction in WC, the difference was slight and not statistically significant (p= 0.1594). *(Figure 3*

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shows the average difference in waist circumference between intervention and control groups.) Interestingly, five participants in the intervention group gained weight, compared to six people in the control group. Three control group participants maintained their weight. This likely skewed the data and added to the non-significance in weight and WC change given the overall small sample size. Linear and multiple, stepwise regression and correlation analysis was added to evaluate contributing and demographic predictors.

3.2 Intervention Group Analysis

Researchers further investigated the intervention group with correlation analysis to understand the effect of the number of meditations on weight and WC difference. The correlation coefficient for meditation count (Mcount) and weight difference was found to be 0.32, indicating a moderate positive relationship. This suggests that an increased number of meditations results in more weight loss. The correlation between Mcount and WC difference was weaker, with a coefficient of 0.24, suggesting a weaker positive relationship between these variables.

A linear regression model, with weight difference as the response variable and Mcount as the only predictor, suggested that the number of meditations may be predictive of the amount of weight loss ($p=0.055$) given the trend toward the standard 0.05 significance level. T-tests showed that amongst those who meditated highly (greater than three times per week), male participants lost an average of 14.25 lbs. and females reduced weight by an average of 6.27 lbs. Although the low sample sizes make significance hard to achieve, these results are promising for future studies. Therefore, correlation and linear regression analyses suggest a potential positive relationship between the amount of meditation and weight difference in the intervention group. Though not statistically significant at the standard level, the near significance is a noteworthy finding.

3.3 Analysis based on Demographic Factors

To account for the potential influence of demographic factors, researchers extended the linear model from above to include several categorical variables as predictors. In the multi-variate model which included marital status, race, campus location, and status designation (student, faculty, staff) with Mcount, several predictors emerged as statistically significant:

- Marital Status (prefer not to answer) had a positive coefficient (Estimate = 11.58662) and was significant at the 0.05 level (p = 0.011712), suggesting that those who preferred not to answer the marital status question had greater weight differences than those who self-categorized as single, married, or divorced.
- Race (Hispanic/Latino and White) had positive coefficients (Estimates = 5.57060 and 10.21631, respectively) and were both significant (p = 0.034119 and p = 0.000251, respectively), indicating that Hispanic/Latino and White participants had greater weight differences than self-categorized Asian, Black, or prefer to not answer.
- Campus locations in Stockton and San Francisco had positive coefficients (Estimates = 5.58311 and 6.19038, respectively) and were both significant (p = 0.034108 and p = 0.004424, respectively), indicating that participants from these campuses had greater weight differences than participants from the Sacramento campus.

This model explained about 67.23% of the variance in weight difference (Multiple R-squared = 0.6723), though the Adjusted R-squared value of 0.5013 suggests that the model might be overfit due to the inclusion of many predictors. *(Figure 4 shows the WT difference by age and gender.)*

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In a similar analysis, researchers evaluated the relationships between demographic factors and the WC difference as the response variable. The linear regression model used key predictors such as Mcount, age, and marital status. Key findings are as follows:

- Age “65 and above” showed a significant positive relationship with WC difference (Estimate = 11.08181, $p = 0.015539$), implying that participants aged 65 and above lost more WC than participants self-categorizing as 18-24 years old, 25-34 years old, 35-44 years old, 45-54 years old, 55-64 years old.
- For Marital Status, “married”, “prefer not to answer”, and “single” categories showed significant positive relationships (Estimates = 9.77937, 10.74612, 8.33087 with p = 0.000688, 0.010187, 0.002675 respectively), indicating that these categories have higher WC differences compared to divorced participants.

The overall model had an Adjusted R-squared value of 0.4569, suggesting that it explains around 45.69% of the variance in WC difference.

The stepwise regression process resulted in a more powerful predictive model. Future studies might consider these factors in designing interventions and analyzing their effects.

3.4 Body Mass Index (BMI)

Researchers also assessed BMI category changes, which could indicate participants moving to a healthier body weight. Based on established standards, a BMI 18.5-24.9 kg/m^2 is considered a ‘normal BMI’, BMI 25.0-29.9 kg/m^2 equals ‘overweight’, and BMI>30.0 kg/m^2 qualifies as ‘obese’. Of note are participants categorized as ‘normal’ BMI at the beginning of the study. Participants in the ‘normal’ BMI range initially presented with a BMI > 25 kg/m^2 during the eligibility screening, and were admitted to the study, but either lost weight in the 2 weeks between the screening period and commencement of the study or erroneously reported weights during eligibility screening. As these participants were already admitted to the study, continuation was permitted. In all, five participants moved from 'overweight' to a 'normal' BMI (intervention = 2, control = 3). In the control group, two people previously categorized as 'normal' BMI gained weight and completed the study in the 'overweight' category. Nine participants moved from the 'obese' to 'overweight' BMI categories intervention = 5, control = 4). *(Table 1 outlines BMI categories within the groups at the beginning and end of the study period.)*

4. **DISCUSSION**

GIM is a centuries-old holistic mind-body technique utilized in Chinese medicine and Native American traditions . It is increasingly gaining contemporary popularity. GIM is an evidence-based intervention promoting relaxation of the mind and the body [27]. It involves guided visualizations of specific mental images while strengthening other sensory modalities, such as smell, touch, taste, and hearing [28]. In GIM or visualization, the mind is intentionally directed to allow images to emerge to facilitate positive change by promoting a sense of well-being and stress reduction, which was shown to even strengthen immune function [31, 32]. Moreover, this pilot study supports the notion that GIM is a low-invasive, cost-effective adjunct in weight management.

While both - control and intervention - groups lost weight during the 12 week study, intervention group participants lost more weight. It is well-established in existing literature that the mere knowledge of participating in a weight loss study generally leads to weight loss, regardless of whether participants are part of the intervention or placebo/control group [33]. This pilot study confirmed the phenomenon. The lack of statistical significance in weight difference between

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groups at the standard $p<0.05$-level can be explained by the small sample size and short study duration, though the trend toward significance is noteworthy. Findings were likely confounded by the fact that all participants were provided with weekly nutrition-focused check-in emails. Arguably, participants were motivated by the admission to the study, mindful of their food or beverage intake, physical activity level, and emotional state, and encouragement to follow through. The weekly emails likely contributed to adherence through reinforcement and accountability. Limited drop-out is a noted strength of this study and a result of constant communication. The effects of periodic follow-up with participants were demonstrated in previous studies [33]. Frequent communications, including education and resources, added benefits for both groups not controlled for by researchers. Authors believe that the weekly educational emails provided to all study participants, while likely contributing to strong participant retention, may have played a role in limiting the significance in weight loss between the intervention and control group. As mentioned above, prior research has shown that people in weight loss studies tend to lose weight regardless of the intervention; however, the weekly emails sent to all study participants may have compounded the amount of weight loss in the control group. If weekly educational emails had not been provided to the control group, the control group may have lost less weight, which in turn may have led to a statistically significant difference between groups.

Correlation analysis demonstrated statistical significance for higher meditation counts and weight difference in intervention group. In other words, those who meditated more lost more weight and WC. While the amount of meditation might be related to weight difference and to a lesser degree WC, demographic factors played a significant role. Our analysis provides evidence that meditation count, marital status, race, and location may influence weight difference among participants using GIM. The amount of meditation in conjunction with age and marital status could influence WC as well. However, given the complexity of the model and the borderline significance of some predictors, these findings should be interpreted with caution. Stepwise selection is not a foolproof method either, and contains limitations such as issues with overfitting, bias, and finding all possible combinations of predictors. Future studies might consider these factors in designing interventions and analyzing their effects using longer durations and larger sample sizes.

The convenient sampling and therefore study population using University of the Pacific students, faculty, and staff is another limitation. While favorable for study authors, it inadvertently limited sampling diversity. It is meaningful to note that researchers were surprised by how many normal weight individuals applied to participate in the study. Exclusion criteria, as stated previously, included individuals with a BMI below 25. Yet, 21 individuals interested in participating in the study were turned away because they were at or below what the medical industry would consider their normal body weight. This points to a much larger problem in which our culture appears to value thinness over health, creating negative relationships with body sizes, regardless of BMI. The fact that people with a normal BMI or below attempted to enter a weight loss study may call attention to strong societal pressures on body image as well as body dysmorphia. This misplaced focus on weight over wellbeing must be converted. It also hints at peoples' motivations. Participant's level of motivation and ability to successfully move towards their weight loss goal is complex and not easily unraveled. Mental health issues such as depression and anxiety – which can be improved through GIM [34] -- add to the complexity but were beyond the scope of this study. This complexity is best dealt with by meeting people where they are and providing individualized solutions to meet their unique needs. Therefore, healthcare providers working

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with patients interested in losing weight need a variety of tools to offer. GIM should be one of those tools.

CONCLUSION

To our knowledge, this pilot study is the first to utilize the novel approach of creating and implementing a lifestyle-focused GIM confirms the integration of meditation as an adjunct to weight management. Those who meditated more frequently lost more weight overall. Given the complex and multifaceted nature of weight management, interventions should focus on various integrated modalities for ultimate success. It is in societies' best interest to combat O/O by promoting patient-centered, long-term, and viable interventions. GIM is a low-invasive, cost-effective tool that can be combined with traditional therapies to foster behavior change. However, more research is needed to confirm the relationship between GIM and weight loss. Future studies should consider 1) creating different lifestyle-focused GIMs for distribution rather than the one used in this study to minimize monotony, 2) increase the sample size, 3) expand the study population and 4) duration beyond 12 weeks. Geographic area expansion could promote increases in sample size and diversifying the study population. Also, future researchers might consider limiting nutrition/lifestyle education to the control group to decrease the confounding effects this type of education can contribute to study results.

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Author Contributions

Karen Roddy – conceptualization, methodology, validation, investigation, resources, data curation, writing, project administration, funding acquisition

Nancy Hamler – supervision, conceptualization, methodology, writing, resources, project administration, funding acquisition, validation, analysis

Niraj Bangari – software, validation, formal analysis, data curation

Eva Lukas – conceptualization, methodology, writing

Author Declarations

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LEGENDS TO FIGURES

Figure 1

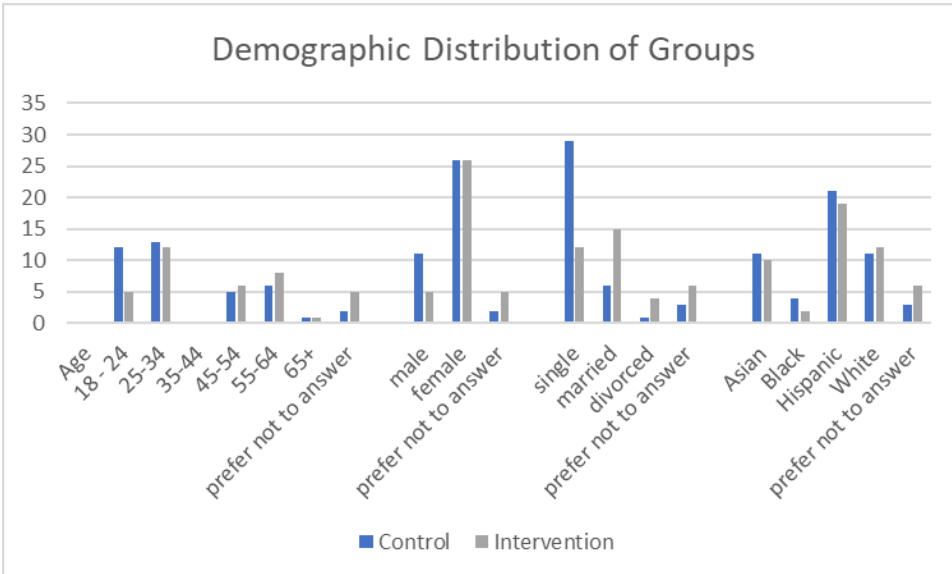

Figure 2 *(Group 1 - intervention, Group 0 – control)*

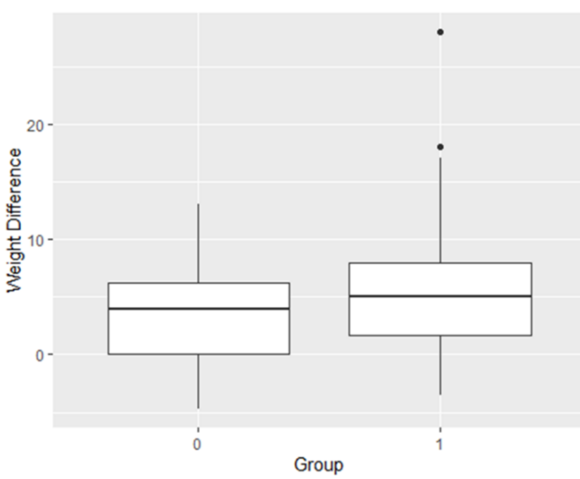

Figure 3 *(Group 1 - intervention, Group 0 – control)*

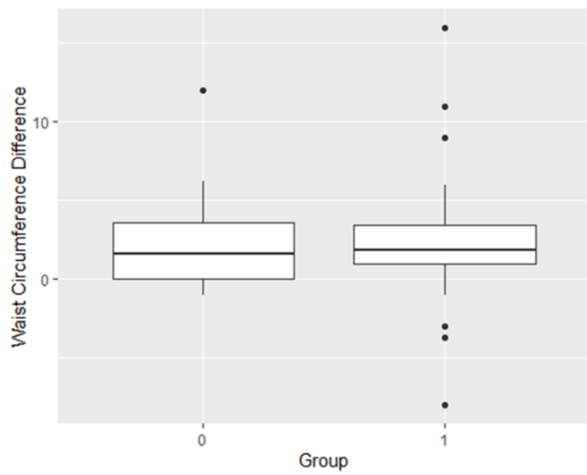

Figure 4

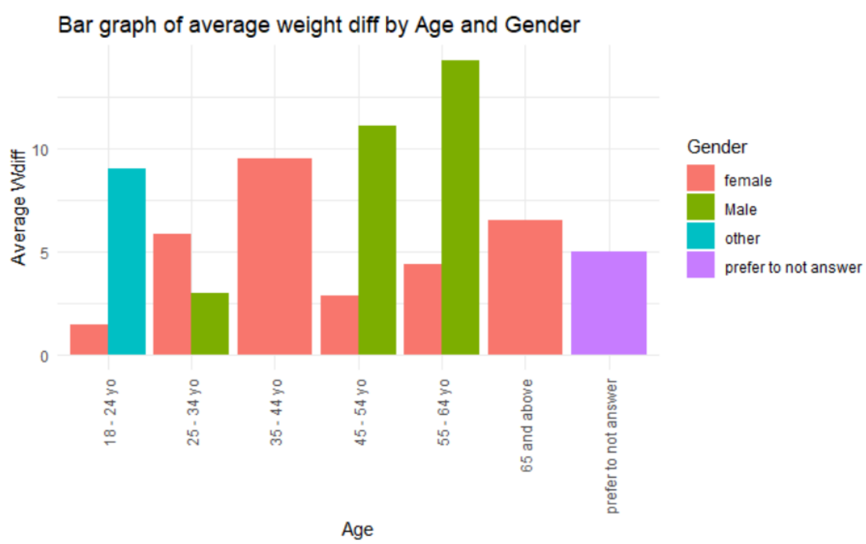

Figure 5

https://scholarlycommons.pacific.edu/pjh/vol7/iss1/14
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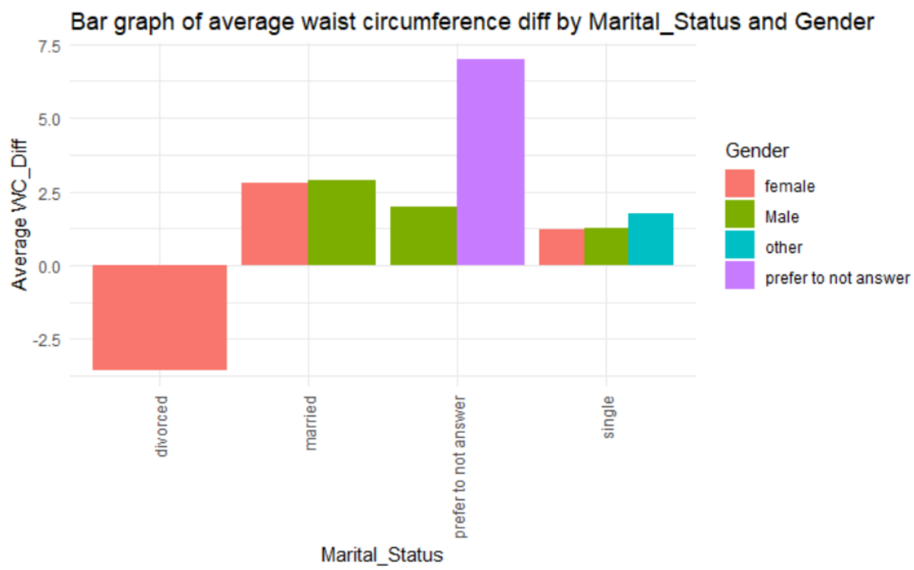

Tables

Table 1 (I=intervention, C=control)

BMI categories	I - beginning	I - end	C - beginning	C - end
Normal*	2	4	4	5
Overweight	11	14	13	16
Obese	24	19	20	16

*between screening for eligibility and start of the study there was wt dif

People allowed to participate because at time of screening their BMI>25, then at start, the week 1 weight would have disqualified them, but were already admitted to the study.