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Pilot Study of Text Message Nudges as a Way to Improve Weight Loss outcomes

THESIS

A thesis submitted in partial fulfillment of the
requirements for the degree of
Master of Science in Nutrition and Food Systems in the
College of Agriculture, Food and Environment
at the University of Kentucky

By

Madison Copher

Lexington, Kentucky

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Lexington, Kentucky

2019

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ABSTRACT OF THESIS

Pilot Study of Text Message Nudges as a Way to Improve Weight Loss outcomes

Weight loss programs for women are on the rise, including both face to face and online programs. However, current research is limited on the process measures and content which produce adherence and the largest outcomes. With obesity on the rise in the United States, it is important to understand out health coaches can strengthen their programs to better support the obese population in their weight loss journey. The purpose of this pilot study was to develop and test the acceptability of text message nudges among women participating in an online weight loss program; determine how dose may be associated with weight loss outcomes; and to test how goal setting text messaging nudges improve percent body weight loss among women participating in an online weight loss program. It was found that the implementation of text message nudges did not provide enough to continue to improve and extend the program to be more successful. However, qualitative data was recorded and found to provide helpful insight into what content was preferred by the participants.

KEYWORDS: Weight loss intervention, Online weight loss program, nudges, goal setting

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Pilot Study of Text Message Nudges as a Way to Improve Weight Loss
Outcomes

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CHAPTER 1.: INTRODUCTION

Summary

Obesity is a major public health problem that has dramatically increased over the past two decades. According to the National Health and Nutrition Examination Survey (NHANES) 2015-2016, 39.8% of American adults were considered obese, with American women having a slightly greater prevalence of obesity than the total average at 41.4%. classified as obese (Hales, 2017) . Modifiable risk factors associated with obesity are dietary intake and exercise habits. However, research to date maintains conflicted about the most effective process for how to lose weight and improve dietary intake. With the rise in technology use, online weight loss programs may be more successful compared to traditional face-to-face weight loss programs. Studies show that text message interventions can provide a tailored individual approach to improving dietary intake, while also having a broad reach to various subpopulations. Weight loss interventions delivered by health coaches through digital platforms are a cost effective and accessible route that can reach a substantial proportion of the overweight and obese population. However, what remains unknown is the process and content of these messages for the most effective outcomes that have the largest public health impact.

Statement of the problem

Technology offers a mode at reaching a wide audiences in terms of health coaching and improving adherence to dietary and exercise habits over time. However, further research is needed to understand process measures (ie timing of message, number of text messages) and content (affective messaging such as motivational messages, goal setting language) which produce adherence and largest outcomes. The purpose of this research is to 1) develop and test acceptability of text message nudges among women participating in an online weight loss program; 2) determine how dose (number of messages returned) may be associated with weight loss outcomes; 3) test how goal setting text messaging nudges improve percent body weight loss among women participating in an online weight loss program.

Research questions

1. What content and process of text message nudges related to dietary intake and exercise have the best acceptability among weight loss participants?
2. Do goal setting nudges by text message improve weight loss in a six-week online program?
3. Do those who return more text messages over the course of 6-weeks have higher percent body weight loss?

Hypothesis

1. Goal setting will improve weight loss among participants in a six-week online weight loss program.
2. Participants who respond more frequently through text messages over 6-weeks will have higher percent body weight loss than participants who don't respond as frequently.

Significance

The significance of this research is that it will provide health coaches a new opportunity to strengthen their online weight loss program to better support the obese population in their weight loss journey.

Chapter 2: Literature Review

Introduction

The primary purpose of this quasi experimental study design is to develop and test acceptability of text message nudges related to dietary intake and exercise habits among women enrolled in an online weight loss program. The second purpose of this project is to test how nudges focused on goal setting and motivational messaging improve percent body weight loss among those participating in an on-line weight loss program. With the rise of obesity during the past two decades, we have found that diet and exercise quality play large roles in percent body weight. In the United States, the current obesity rates are 39.8%.

The CDC states that adults age 40-59 experience higher obesity rates at 42.8% compared to other age groups. America in particular, has the highest obesity prevalence in the world. African American women also tend to have higher rates of obesity than white women (Jarolimiva, 2013). In the past decade, obesity rates have affected over 900 million Americans. Due to this epidemic, the need for weight loss programs is increasing, however, distinctly understanding what components of a weight loss program are needed for the greatest weight loss is less understood.

Obesity and Comorbidities in Women

Obesity is considered to be an epidemic of the 21st century given its association with type 2 diabetes, coronary heart disease and certain cancers, and a shorter life expectancy (Bulio, 2007). Not only is obesity associated with chronic disease and an overall shorter life expectancy, in America, more than 5% of the national health expenditure in the United States is directed at medical costs associated with obesity. An estimated \$147 billion is associated with obesity (Khaodhiar, 1999). Individuals who are obese may also suffer from social stigmatization and discrimination, and may experience greater risk of impaired psychosocial and physical functioning, impacting their quality of life. As a result, obesity is now among the leading factors for global morbidity and mortality and causes more global deaths than being underweight.

How diet and Physical Activity influence obesity

Modifiable factors such as diet and physical activity play an important role in a woman's body fat percentage, classifying her as overweight or obese. In particular studies have documented that diets high in processed foods, such as fat and sugar, are associated with greater obesity rates. In 2017, Bhurosy conducted a study connecting consumption of ultra-processed food and the risk of overweight and obesity. It was concluded that consumption of ultra-processed food was associated with higher risks of overweight and obesity, specifically in participants who fell in the highest quartile of ultra-processed food consumption. A study investigating the effecting of high-fat diets on obesity and visceral adipose tissue found a significant increase in body weight than participants on a normal diet (Tag, 2014). With an increase in different diets, it is difficult to determine which diet techniques are beneficial and harmful to one's weight loss journey. Another study looked at the high sugar and butter (HSB) diet when compared to just a high fat or high sugar diet. The HSB diet resulted in greater weight gain among mice as well as presented with higher levels of fasting serum glucose, which is a known risk associated with obesity. In addition to dietary changes, physical activity can also aid in weight loss. Studies show that interventions targeting physical activity are necessary to affect weight gain and improve long-term weight loss (John, 2002). A study specifically found that endurance training appears to be the most effective in the respect of beneficial effects on health and well-being, as well as resistance training and high-intensity interval training play distinct roles in the effectiveness of exercise interventions as well (Petridou, 2018). Exercise has the potential to alleviate the health

consequences of obesity and specifically aid in weight loss leading to be a key tool in the management of obesity alongside a whole foods diet.

Traditional Face to-Face Weight Loss Programs

Traditional weight loss programs can be defined as commercial programs, requiring weekly or monthly meetings with trainers and untrained health coaches many times with specialized food. In 2018, the US Preventive Services Task Force (USPSTF) has found evidence that behavioral interventions in adults with obesity can lead to clinically significant improvements with weight status as well as reduce the incidence of type two diabetes among adults with obesity and elevated plasma glucose levels. Another study found that behavior-based weight loss interventions had a greater mean weight loss after one year and less weight regain compared to the control group who did not receive the intervention (LeBlan, 2018). However, traditional weight loss programs are associated with high costs, high attrition rates, and a high probability of regaining 50% or more of lost weight in 1 to 2 years. Many clinicians refer patients to commercial weight loss programs due to their different obesity treatment options, outside of general weight loss education, as well as promising-weight loss results. A study looked to compare the weight loss of commercial programs versus a control and health educated curriculum groups in both overweight and obese adults. Results found that all commercial programs resulted in a greater weight loss than the control/education (Gudzune, 2015). These traditional programs consist of a variety of interventions including meal replacements, very-low-calorie, low-carb and individualized packaged meals. The concern with commercial weight loss

programs is evaluation of long term adherence and outcomes to these traditional programs. Many of these programs have high rates of attrition where participants found dietary changes to be unsustainable after the conclusion of the program (Mcevedy, 2017). In addition, a systemic review by Vakil in 2016 concluded that no one commercial weight loss program provided evidence for improved mean weight and waist circumference change.

Technology Based Programs for Weight Loss

The use of technology is a popular communication channel for weight loss interventions. Technology is currently being used in a variety of ways including tracking physical activity and monitoring daily intake. In a recent study, recruitment rates for a FaceBook based intervention were similar to recruitment rates from an in-person intervention (Silfee, 2018). Health coaches can utilize these digital platforms to provide a lower cost and easily accessible route that can reach a substantial proportion of the overweight and obese population. Online weight loss programs provide interventions that can reach large numbers of individuals in a timely and cost-effective manner. Multiple studies view the benefits that internet tracking of energy intake and energy expenditure has during a weight loss program. One study suggest that the use of mobile methods for tracking physical activity and diet is associated with increased energy expenditure and decreased energy intake in individuals who are trying to lose weight (Gabrielle, 2013). Many view online programing as easily accessible, quick and inexpensive. To help stimulate engagement and interaction among participants, Spohr and Nandy (Spohr, 2015) found that using text message

interventions provided a wide reach and low cost intervention. The result of this specific study suggest that SMS text messaging may be a promising way to increase the outcome of those intending to quit smoking. A study focused on text message interventions on behavior changes found that text message interventions are capable of producing positive change in preventive health behaviors (Armanasco, 2016). A survey by Roug and Allman-Farinelli explained that young adults found messages about obtaining enough calcium from non-dairy sources would encourage them to eat more calcium rich foods. They concluded that short, aesthetically pleasing and personally relevant messages were recommended to aid in health promotion (Marcinow, 2017).

Chapter 3: Methodology

Research design

This study used a quasi-experimental research design among n=24 women in the United States over a six-week period during a six-week online weight loss program.

Participants

The intervention through a commercial online weight loss program is offered through a social media platform of FaceBook. The weight loss program offers group sessions with tailored goals each day related to weight loss outcomes and eating behaviors. Each day participants are to record their food intake via the MyFitnessPal app which uploads their dietary intake and exercise habits into the Facebook group platforms. Through these groups the health coach provides input on their successes and areas for improvement to reach weight loss goals. In addition recipes are shared as well as shopping tips, exercise routines, and motivational messaging. Participants pay to participate in the program to receive tailored feedback each day and to have all their questions answered at an individual level. They also receive social support through the FaceBook page. The overall program is 6 weeks long and each day they receive information about healthy eating and methods for weight loss.

Women participating this online weight loss program were recruited to participate in this study (n=24). All participants were located across the United

States and were enrolled in the same online weight loss program. The online weight loss program is opened to both men and women, however for this study, only women were included. The Registered Dietitian who created the program granted permission to conduct in this study and a letter was sent out to all participants in the most recent round of the online weight loss program. The letter promoted additional motivation and encouragement and those who agreed to participate provided a number they could be reached at through text messaging.

Measurements

Data was collected twice a week for six weeks; a question at the beginning of the week followed by an acceptability scale at the end of the week. Both sets of questions can be found in the appendices. The question sent out through text messages at the beginning of the week included nudges focused on dietary intake, macronutrient goals, and physical activity to help establish goals throughout the program. The follow up question included a Likert scale on which participants recorded how well the previous message helped them reach weekly goals as outlined in the program. We recorded if participants responded to the text messages, and if so, if they met their goal. In addition, the number of interactions or text message exchanges between the health coach and participant were recorded. Participants self-reported weight and height prior to the start of the intervention. Post intervention, participants will again self-report weight and height and percent weight change will be calculated.

Statistical analysis

Data were entered into Microsoft Excel and coded. Statistical Analysis System (SAS) was used to analyze the data. Simple linear regression will be used to compare differences in percent weight change and participants who met their goal vs. participants who did not meet their goal as well as percent weight change and participant who responded vs. participants who did not respond. T-test will be conducted to evaluate the effects of number of text interactions on percent weight change and goal setting. In addition, descriptive statistics will be used to summarize the perceived acceptability of each weekly question. Significance will be determined by a p-value of 0.05 or below.

Chapter 4: Results

A total of 23 participants were included in this study; 100% were female with an average initial Body Mass Index of 31.75 as shown in *Table 1*. Of the participants, 17% were normal weight (18.5-24.9), 31% were overweight (25-29.9), and 52% were obese (30<). Tables 2-7 demonstrate the percent of participants of their response to each weekly nudge through meeting the goal, the number of text message exchanges and the how well they understood and stayed on track because of the nudge.

Initial Weight	187.22 lbs
Post Weight	178.11 lbs
Pre BMI	31.75 lbs
Post BMI	30.19 lbs

Table 2: Nudge on Intake of 64fl oz of water

<i>Meeting Water Goal of 64fl oz</i>		
No response	4%	1
Did not meet goal	30%	7
Meet Goal	65%	15
<i>Text message exchanges on water goal</i>		
Less than 2 times	9%	2
3 times	61%	14
4 or more time	30%	7

<i>Understanding water goal question</i>		
No response	30%	7
1 Very difficult	4%	1
2 Difficult	0%	0
3 neutral	0%	0
4 Easy	4%	1
5 Very Easy	61%	14

Table 3: Nudge on Using MyFitnessPal

<i>Meeting goal of using MyFitnessPal</i>		
No response	43%	10
Did not meet goal	0%	0
Meet Goal	57%	13
<i>Text message exchanges on MFP</i>		
Less than 2 times	48%	11
3 times	9%	2
4 or more time	43%	10
<i>Text message on MFP to stay on track</i>		
No response	35%	8
1 Not at all	17%	4
2 Somewhat	13%	3
3 Neutral	13%	3
4 Somewhat	9%	2
5 a lot	13%	3

Table 4: Nudge on High Intensity Interval Training

<i>Meeting goal of HIIT workouts</i>		
No response	52%	12
Did not meet goal	22%	5
Meet Goal	26%	6
<i>Text message exchanges on HIIT workouts</i>		
Less than 2 times	52%	12
3 times	17%	4
4 or more time	30%	7
<i>Text message on HIIT workouts to stay on track</i>		
No Response	30%	7
1 Not at all	22%	5
2 Somewhat	17%	4
3 Neutral	4%	1
4 Somewhat	9%	2
5 a lot	17%	4

Table 5: Nudge on Macronutrient Management

<i>Meeting goal of Macro Management</i>		
No response	57%	13
Did not meet goal	0%	0
Meet Goal	43%	10
<i>Text message exchanges on Macro Management</i>		
Less than 2 times	61%	14
3 times	17%	4
4 or more time	22%	5

<i>Text message on Macro Management to stay on track</i>		
No response	48%	11
1 Not at all	4%	1
2 Somewhat	22%	5
3 Neutral	9%	2
4 Somewhat	13%	3
5 a lot	4%	1

Table 6: Nudge on Weekly Exercise

<i>Meeting Exercise Goal of 3 times a week</i>		
No response	52%	12
Did not meet goal	0%	0
Meet Goal	48%	11
<i>Text message exchanges on exercise goal</i>		
Less than 2 times	100%	23
3 times	0%	0
4 or more time	0%	0
<i>Understanding exercise goal question</i>		
No response	57%	13
1 Very difficult	0%	0
2 Difficult	0%	0
3 neutral	0%	0
4 Easy	4%	1
5 Very Easy	39%	9

There were no strong correlations between meeting the goal or not meeting the goal and their weight change or percent body weight change (*Table 7*). *Table 8* describes the differences in means between high interaction group (individuals with four or more text message exchanges) and low interaction group (less than 4 text messages) and how their weight change and percent body weight change differed. There were no significant differences between weight change and percent body weight change when comparing the high interaction group to the low interaction group.

Table 7: Correlation of Meeting Goal with Weight Change and Percent Body Weight Change

	Weight Change	% BW change
Water Goal	0.0142	0.0115
MFP Goal	0.0131	0.007
HIIT Goal	0.1055	0.2149
Macros Goal	0.051	0.0997
Weekly Exercise Goal	0.0607	0.0663

Table 8: Difference in Means Between High Interaction Group and Low Interaction Group and Weight change and Percent Body Weight Change

	WT Change	% BW Change
Water Interactions	0.91 [-0.9693, 2.8]	-.0055 [-.01, .022]
MFP Interactions	-0.18 [-1.97, 1.61]	-.0057 [-.009, .021]
HIIT Interactions	-0.18 [-1.97, 1.6]	-.005 [-.009, .02]
Macro Interactions	-0.9 [-3.0168, 1.2168]	.004 , [-.0225, .0143]
Exercise Interactions	1.12 [-.66,2.92]	.01 [-.005, .025]

Chapter 5: Discussion

The current pilot study found that implementation of text message nudges did not provide enough to continue to improve and extend the program to be more successful. When comparing the relationship between weight change and meeting each goal, meeting the High Intensity Interval Training (HIIT) goal had a slightly higher positive correlation. Within this weekly nudge, pictures of exercises were included and may have played a role in participants who completed those workouts (meeting goal) in a greater weight loss. As the weight loss program included tailored goals each day related to weight loss outcomes and eating behaviors, some weekly nudges were at greater advantages. On the day the nudge about water intake was set out, it was initially unknown that participants were completing a twenty-four hour fast. During this fast, participants were allowed to drink water, tea and coffee. The nudge had the highest percent of the goal being met, most likely due to the fast. The program also highly encouraged

the use of a food tracking device, such as MyFitnessPal prior to the start of the program. While only 57% of participants met the goal, the other 43% did not respond to the text messages, concluding that no participant failed to meet the goal of using MyFitnessPal. Although there were no significant differences between weight change and percent body weight change when comparing the high interaction group to the low interaction group, there tended to be a trend of greater weight loss and greater percent body weight change in the high interaction group.

Throughout the six weeks, communication with participants via text messages was also recorded through qualitative data. Through the process of communication with participants we learned that including a recipe in the weekly nudge was found to generate more conversations and was well received by participants. In addition, we learned that participants preferred to have weekly nudges at the beginning of the week as opposed to the middle or conclusion of the week. We also learned that participants wanted a more individual attention the text message responses. In addition, they wanted a tailored system available for round the clock support. It was also noted that working with the individual participant to establish goals through the six weeks was preferred over having predetermined goals.

Limitations

Limitations of this study included recruitment of participants. Participants were already signed up for an online weight loss program and there were no restrictions as to the location of the participant due to the nature of the satellite program. In addition, during data collection, it is unknown if participants who did not respond to the text message intervention read the messages. Therefore it is difficult to understand if those in the non-response group benefited from the intervention in terms of percent weight change.

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