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THE UTILIZATION OF TECHNOLOGY AS AN APPROACH TO IMPROVE MEAL PLANNING AND DIETARY INTAKE

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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

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ABSTRACT OF THESIS

THE UTILIZATION OF TECHNOLOGY AS AN APPROACH TO IMPROVE MEAL PLANNING AND DIETARY INTAKE

The prevalence of obesity is rising in the United States and one factor that contributes to it is the lack of cooking at home and planning out meals. Since text messaging is now a main avenue of communication, it could be used to motivate people to plan out their meals and cook at home instead of consuming fast food. Current research on how weekly nudges might relate to peoples' goals about meal preparation and dietary intake is very limited. The purpose of this study was to examine if sending weekly nudges, focusing on specific dietary goals, improves meal planning and dietary intake in an online meal planning group. A Facebook group was used to send weekly nudges to the participants throughout six weeks. It was found that meal planning appears to have a significant effect on meal preparation at home and thus may help improve dietary intake. The results found can also be utilized in other aspects of leading to healthier lifestyles and motivation-need situations such as weight loss.

KEYWORDS: Text Messaging, Nudges, Meal Planning, Dietary Intake

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12/02/19

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Summary

The prevalence of obesity is increasing worldwide and specifically in the United States (Hales, 2017). It can lead to many serious comorbidities such as heart disease and diabetes (Overweight & Obesity, 2018). The development of obesity is multifactorial. One factor is lack of cooking at home and the planning of meals. Given the high rise in the use of technology (smartphones and social media) perhaps utilizing this technology as a way to improve meal planning and an intake of fruits and vegetables may be effective.

More people are showing increased curiosity in and/or practicing meal planning and preparation; thus it is of interest to improve fruit and vegetable intake through these practices. Text message interventions are demonstrated to encourage physical activity in young adults (Mutsuddi, 2012), suggesting that text message nudges may be effective in promoting healthy behaviors in our target population, women. However, there is little research on text message or nudge interventions to motivate women to meal plan and prepare. Specifically, this project will determine the efficacy of weekly text message nudges (nudges) related to meal preparation and dining out goals in improving dietary intake.

Cooking meals at home as well as meal preparation and planning are successful in leading to a healthier lifestyle and eventually aiding with losing weight (Kruger, 2006). This research will examine using nudge text message interventions specifically focused on meal preparation and planning to improve

meal planning along with dietary intake among the participants in an online meal preparation group.

Statement of the Problem

More people are starting to use online programs and groups and we need to find ways to improve their goals and outcomes. However, there remains a gap in this field to assist people in staying engaged in these programs and if effective nudge messages might assist individuals in meeting their goals. Since there is also limited research exploring how weekly nudges might relate to peoples' goals about meal preparation and dining out, the study will explore this method in improving their dietary intake. The purpose of the research is to examine if sending weekly nudges, focusing on specific dietary goals, improves meal planning and dietary intake in an online meal planning group.

Research Questions

1. Will those who respond more frequently to nudges consume more fruits and vegetables compared to those who do not respond as frequently?
2. Will those who receive nudges of meal preparation and planning improve their food shopping practices (eating out; purchasing fruits and vegetables; meal preparation)?

Hypothesis

1. Those who respond more frequently to nudges will consume more fruits and vegetables compared to those who do not respond as frequently.
2. Those who receive nudges of meal preparation and planning will improve their food shopping practices relative to those who do not receive the nudges.

Significance

Given the low intake of fruits and vegetables across various populations, effective low-cost interventions are needed to sustain and improve behavior change. This research is being conducted to find out if nudges are successful in aiding people with meal planning and dietary intake. Without this research, we will not know the benefits of sending nudges to remind and encourage people through their healthy lifestyle journey. The significance of this research is that it will provide new opportunities to develop future online interactive programs to be used across various sectors (Cooperative Extension, Health Departments, health insurance) and to improve peoples' goals and outcomes.

Chapter Two: Literature Review

Introduction

Obesity is an ongoing and growing problem worldwide and specifically in the United States. It can lead to many serious comorbidities such as heart disease and diabetes. The prevalence of obesity was 39.8% and affected about 93.3 million of US adults in 2015-2016 (Overweight & Obesity, 2018). Factors

including meal preparation and planning, cooking at home, and eating more fruits and vegetables have the potential to improve dietary intake. Targeting these factors in an online meal planning group could help participants succeed in their goals and improve their dietary outcomes. Because of the growth in popularity of the internet and smartphones, online medical programs and interventions are growing, including online programs to assist individuals with meeting key dietary goals such as increasing fruit and vegetable consumption.

The problem is that the methods to make online programs and groups more effective is unknown. A new type of intervention is using text messages as nudges to send to group participants as motivation and reminders. There have been a few studies on the use of text message interventions in multiple settings. Text message interventions are demonstrated to encourage physical activity in young adults (Mutsuddi, 2012), suggesting that text message nudges may be effective in our target population, women. An eight-week text-messaging intervention led to increases in self-reported fruit and vegetable intake and improvements in goal setting for healthier dietary behaviors (Gustafson, 2019). A systematic review was performed to provide an overview of behavior change interventions for disease management and prevention delivered through text messaging (Cole-Lewis & Kershaw, 2010). To date it appears that the use of mobile technologies and text messaging may improve existing practices and interventions (Cole-Lewis & Kershaw, 2010). Also, text messaging may be an important tool to reduce the global burden on health care by providing more effective disease prevention and management support (Cole-Lewis & Kershaw,

2010). All studies have shown to have positive outcomes from text messaging interventions.

However, there is little research on text message interventions that aim to improve meal planning and meal preparation as a way to improve dietary intake. Specifically, this project will determine the effectiveness of weekly nudges related to meal preparation, cooking at home, and fruit and vegetable consumption goals in improving meal planning and dietary intake.

Part I: Obesity Trends and Implications

The Centers for Disease Control and Prevention (CDC) indicates that of women aged 40 to 59 years old, 44.7% are obese and of women aged 20 to 39 years old, 36.5% are obese (Hales, 2017). Obesity prevalence increased in both adults and youth during the 18 years between 1999 to 2000 and 2015 to 2016 (Hales, 2017). From 1999 to 2000 through 2015 to 2016, a significantly increasing trend in obesity was observed in both adults and youth (Hales, 2017). In 1999 to 2000, 30.5% of adults aged 20 and over in the United States were obese (Hales, 2017). In 2015 to 2016, 39.6% of adults aged 20 and over in the United States were obese (Hales, 2017).

The development of obesity is multifactorial and a complex disease that is the result of many different parts of a person's life that happens over a long period of time (Weight and obesity, 2019). Metabolism, age, trauma, medications, sleep, and genes and family background are some factors that could affect weight (Weight and obesity, 2019).

Effects on Health

There can be many side effects and health consequences of obesity. The CDC reported *Adult Obesity Causes & Consequences* includes: hypertension, high LDL cholesterol/low HDL cholesterol, dyslipidemia, type 2 diabetes, coronary heart disease, stroke, gallbladder disease, osteoarthritis, sleep apnea/breathing problems, some cancers (endometrial, breast, colon, kidney, gallbladder, and liver), low quality of life, mental illnesses (clinical depression, anxiety, and other mental disorders), body pain/difficulty with physical functioning, and mortality (Overweight & Obesity, 2018).

There are also economic and societal consequences that come with obesity such as direct and indirect medical costs (Overweight & Obesity, 2018). Direct medical costs may include preventative, diagnostic, and treatment services related to obesity and indirect costs related to morbidity and mortality costs including productivity (Overweight & Obesity, 2018).

Obesity can take a toll on the body, health, and mind as well as other aspects of life such as money and time. The seriousness of the corborbities resulting from obesity can be alarming and the personal monetary costs can be high. Weight loss interventions exist but not all work efficiently and effectively. One key factor related to high rates of obesity is poor dietary intake, specifically low intake of fruits and vegetables.

Intake of Fruits and Vegetables

The 2015-2020 Dietary Guidelines for Americans recommend that Americans consume more fruits and vegetables as part of an overall dietary

pattern to reduce the risk of diet-related chronic diseases such as cardiovascular disease, type 2 diabetes, some cancers, and obesity (Lee-Kwan, 2017). The recommendation is that adults should be consuming 1.5-2.0 cups of fruits and 2.0-3.0 cups of vegetables (Lee-Kwan, 2017).

In 2013, 13.1% of adults met the fruit intake recommendations and 8.9% met the vegetable intake recommendations (Lee-Kwan, 2017). In 2015, 12.1% of adults met the fruit intake recommendations and 9.3% met the vegetable intake recommendations (Lee-Kwan, 2017). In those two years, fruit intake had gone down and vegetable intake barely rose. From this data, it is clear that American adults need to increase their fruit and vegetable consumption because the current intake is very low. Increasing fruit and vegetable intake may combat the risk for chronic diseases.

Part II: Technology based Interventions as a way to Improve Dietary Intake

With the internet becoming more and more popular, online programs and interventions for medical care are on the rise. Online medical care can include weight loss programs and interventions. Technology based interventions are the use of technology such as computers, mobile devices, and applications to change a behavior. There are many advantages and disadvantages to these online programs and groups.

Advantages and Disadvantages

Waring et al conducted a study to gauge interest in a Twitter-based weight loss intervention among women of childbearing age and the feasibility of recruiting via Twitter (Waring, 2016). Twitter is a popular social media website

that also has a downloadable app for smartphones. From the study, 59% of the women reported advantages of the program that included the themes of support/accountability, convenience, and privacy/lack of judgement (Waring, 2016). 59% of the women reported disadvantages of the program that included the themes of low support/accountability, technology concerns, lack of privacy, not engaging, and lack of efficacy (Waring, 2016). 51% of the women reported both advantages and disadvantages of the program (Waring, 2016). This study used the same population as the focus of our study, as well as using an online weight loss intervention. The participants in this study liked the support, convenience, and privacy of using an online weight loss intervention for our research, which is also true in our study.

A study conducted by Thomas et al aimed to evaluate a commercial online weight loss program and activity tracker, which are popular but have unknown efficacy (Thomas, 2017b). The study compared three options for weight loss programs; Weight Watchers ® Online program alone (WWO), WWO with the ActiveLink activity tracking device (WWO+AL), and an online newsletter for a control group (Thomas, 2017b). The WWO had weight losses significantly greater than the online newsletter at three months into the programs but neither differed from the WWO+AL (Thomas, 2017b). Thomas et al also conducted a similar study to evaluate the effects of an online commercial weight management program, with and without provision of a ‘smart’ scale (Thomas, 2017a). Daily instructions included to weigh daily and weekly tailored feedback was provided

on weight loss and the frequency of body-weight self-monitoring (Thomas, 2017a). The engagement tactic used for this study was the ‘smart’ scale interaction. It was shown that the ‘smart’ scale improved weight loss but the results were not significant. These two studies shows that technology such as smart trackers and scales are great advantages that can be used to help improve the outcomes of online weight loss programs.

A randomized trial was conducted by Hutchesson et al to determine whether the consistency of self-monitoring differed between participants randomly assigned to a basic or an enhanced 12-week commercial Web-based weight loss program (Hutchesson, 2016). The enhanced group’s consistent use of self-monitoring tools was significantly greater than that of the basic group throughout the study (Hutchesson, 2016). It was concluded that enhanced features, including additional individualized feedback and reminders, are effective in enhancing self-monitoring behaviors in a Web-based weight loss program (Hutchesson, 2016). This study shows that using reminders, such as text message nudges, can be useful in helping people in online weight loss programs and groups.

A qualitative investigation by van Beurden et al was conducted to explore factors that might influence primary care patients’ initial dietary intake with continued use of online weight management interventions (van Beurden, 2018). Self-directed interventions delivered through digital platforms (eHealth) are plentiful and it was found that they provide a low cost and easily accessible alternative to existing treatment options in primary care (van Beurden, 2018).

Findings suggested that patients were initially motivated to engage with internet-based weight loss programs by their accessibility and novelty (van Beurden, 2018). Advantages found to online weight management programs included motivation through tracking features and email reminders, personal preferences, and appeal of website (van Beurden, 2018). The appeal of the website, to be captivating, interesting, and make the participant want to be engaged, can be a strong advantage to a weight loss program.

van Beurden also found that there are some disadvantages to online weight loss interventions. Some of the barriers reported include effort, time and commitment, lack of novel or useful information, accessibility and disposability, email reminders, and perceived target group and appeal of website (van Beurden, 2018). People are choosing an online weight loss intervention because they think it will be easier to complete than an in-person program and it will take less effort. Therefore, when creating an online weight loss program or group, there must be minimal effort for participants to use the program or participate in the group. An important thing to remember when creating an online program is to remember your audience. Use your audience to your advantage and make sure they will like the design and functionality of the program. The appeal of the website can also be an asset to the participants of a program. It is important to make sure that the website is geared towards your entire audience and not just one group of the audience. It should be appealing and useful to all participants.

In summary, some advantages to weight loss programs are their ease, convenience, and the potential to make people feel engaged. Some

disadvantages include lack of personability and cumbersome use of technology. It is clear that there is an area of opportunity to make future programs better for the participants to meet their dietary and/or weight goals and outcomes.

Facebook as a Weight Loss Program Tool

Facebook is a social media website that has the ability to create groups with members to share pictures and posts. This can be a great platform to use for a weight loss program to create a community in the group.

A study conducted by Waring aimed to evaluate the feasibility and acceptability of a Facebook-delivered postpartum weight loss intervention (Waring, 2018). The findings from this study suggests that this Facebook-delivered intervention is feasible and acceptable, supporting research to test efficacy for weight loss (Waring, 2018). Research is needed to determine how best to engage participants in social network-delivered weight loss interventions (Waring, 2018). There has been research done on how online weight loss programs can be improved and is discussed in the next section.

Another study was conducted by Napolitano and examined feasibility, acceptability, and initial efficacy of a technology-based 8-week weight loss intervention among college students (Napolitano, 2013). The results from this study indicate the potential for an innovative weight loss intervention that uses technology platforms (Facebook and text messaging) that are frequently used and already integrated into the cultural life of college students (Napolitano, 2013).

From these studies, we can see that integrating Facebook into a weight loss intervention can be beneficial because of the popularity of Facebook as well

as the ability to create a community and a place to interact with others going through the same process to stay motivated to eventually reach goals and outcomes easier.

Increasing Impact of Online Programs

It is vital to keep participants engaged and excited throughout the use of an online program. The participants should be motivated to complete their goals. Continued use was influenced by substantial facilitators and barriers, such as time and effort involved, reaction to prompts/reminders, and usefulness of information (van Beurden, 2018). “Facilitation by face-to-face consultations with the GP was reported to be helpful in supporting change” (van Beurden, 2018).

van Beurden suggested recommendations for future development and refinement of internet-based weight loss interventions and are as followed; personally tailored where possible (choice of style, delivery format, number of reminders), good organization of detailed information, minimal effort for user, present lifestyle changes in a manner that reduces the perceived effect and time to implement such changes, address motivation and prioritisation, provide a safe environment to disclose sensitive information, and utilize face-to-face support along with web-based support (van Beurden, 2018).

From this study, it is known that when creating an online weight loss program it should be personal, up-to-date, require little effort for the participant, motivating, supporting, and collaborate online portion with face-to-face support (van Beurden, 2018). Using these recommendations will help future online programs and interventions be more successful for the outcomes of participants.

Although we have some recommendations for improving future programs, it still needs to be investigated on how to make the programs the most impactful for the participants.

Part III: Meal Planning, Preparation, and Cooking at Home

Impact on Diet

Cooking at home along with meal preparation and planning is now becoming a necessary strategy as a way to improve dietary intake. There are many positive accounts for cooking meals at home instead of going out to eat and meal preparation and planning meals ahead of time.

An advantage of cooking at home rather than going out to eat is that it can lead to a healthier diet as well as decrease portion sizes. Wolfson conducted a study to examine national patterns in cooking frequency and diet quality among adults in the United States, overall and by weight-loss intention (Wolfson, 2015). It was found that cooking dinner frequently at home is associated with consumption of a healthier diet whether or not one is trying to lose weight (Wolfson, 2015). This shows that even when someone is not trying to intentionally lose weight, cooking meals at home can lead to a healthier lifestyle and a potential loss of weight.

An analysis was performed to assess whether frequency of consuming home cooked meals was cross-sectionally associated with diet quality and cardio-metabolic health (Mills, 2017). The study found that eating home cooked meals more frequently was associated with a range of indicators of a healthier diet and several markers of cardio-metabolic health including adiposity,

cholesterol and diabetes risk (Mills, 2017). The findings from this study suggest that regularly eating home cooked meals may confer benefits to diet and health, and that home cooking promotion and skill development should form part of future public health initiatives (Mills, 2017). This research shows the importance of cooking meals at home from a health perspective.

Another advantage of meal preparation and planning is that it can increase fruit and vegetable consumption, which also aids in eating healthier in general. A study by Vanderlee was conducted in order to characterize grocery shopping and dinner preparation behaviors among young people in Canada and also to examine associations with eating habits (Vanderlee, 2018). It was found that increased participation in grocery shopping and dinner preparation were associated with healthier dietary habits (Vanderlee, 2018). Also, more frequent engagement in dinner preparation was associated with increased vegetable and fruit consumption (Vanderlee, 2018).

These studies show that cooking at home has many assets including a healthier lifestyle. But there is a large gap in the literature with research on meal preparation, planning and fruit and vegetable intake.

Importance of Meal Planning and Meal Preparation

Kruger conducted a study to look at dietary and physical activity behaviors among adults successful at weight loss maintenance (Kruger, 2006). It was found that self-monitoring strategies such as weighing oneself, planning meals, tracking fat and calories, exercising 30 or more minutes daily, and/or adding physical activity to daily routine may be important in successful weight loss maintenance

(Kruger, 2006). Therefore, planning meals may lead to weight loss maintenance. Also, leisure-time activities such as lifting weights or cooking/baking for fun are common strategies reported by those who were successful weight losers (Kruger, 2006). This shows that cooking and baking at home can be fun activities that may lead to weight loss without it seeming like a chore. Significantly, more successful versus unsuccessful weight losers reported that on most days of the week they planned meals (35.9% versus 24.9%) (Kruger, 2006).

Appelhans conducted a study to determine whether baseline levels and longitudinal changes in meal preparation and cleanup time are associated with changes in cardiometabolic risk factors in midlife women (Appelhans, 2015). It was concluded that in midlife women, longer meal preparation and cleanup time is associated with the development of a less adverse cardiometabolic risk profile (Appelhans, 2015). Therefore, the more meals that are cooked at home, the less risk women have of developing a comorbidity of obesity.

It is now commonly accepted knowledge that cooking at home and preparing and planning meals ahead of time can help people lose weight as well as lead to a healthier lifestyle. Continued research will further support and expand our knowledge based on this topic.

Part IV: Nudges

In this day and age, text messaging is a primary form of communication. Sending text messages or nudges to people can be a convenient way to help remind them to do something, motivate them, or help them achieve outcomes.

Text messaging and the use of smartphones are becoming more popular for delivering medical care. Most research on text messaging as a good delivery for healthcare are short term, 10 days to 3 weeks (Mutsuddi, 2012). After conducting a longer term study of 3 months, Mutsuddi found that texting can indeed encourage physical activity in young adults (Mutsuddi, 2012).

Allen et al made a systematic review of technology-assisted weight management interventions (Allen, 2014). It was found through studies that the use of technology-assisted behavioral interventions, particularly those that incorporate text messaging or email, may be effective for producing weight loss among overweight and obese adults (Allen, 2014).

Another systematic literature review conducted by Holmes sought out to find the impact of digital technologies for communicating messages on weight loss maintenance (Holmes, 2017). Holmes concluded, “Digital technologies have the potential to be effective communication tools for significantly aiding weight loss maintenance, especially in the short term (from 3 to 24 months)” (Holmes, 2017).

Newton et al conducted a study aimed to assess the feasibility and efficacy of a church-based weight loss intervention that incorporates mHealth technology (Newton, 2018). It was found that automated text messages were well-received by the participants of the study (Newton, 2018). This suggests that more enhanced mHealth technologies are a viable option for interventions targeting African American adults (Newton, 2018).

Through these studies, it is shown that nudges can be successful in improving intervention outcomes. Since texting is so prevalent now, it is one of the major avenues for communication. Having the convenience of reminders as text messages on your phone may be successful for online programs. Also, since this topic is so new, there is little research on nudges and dietary intake interventions. Hence, it needs to further be explored.

Conclusion

Based on obesity data, there is a growing problem for our target population of women aged 20 to 60 years old in the United States. We also know that when it comes to obesity, most of the time, comorbidities and consequences come along with it.

From the conducted research on online programs, we know that there are advantages and disadvantages. Knowing these aspects of previous programs, we can improve future online interventions by using the assets to our advantage. Programs must be appealing to the audience, require little effort, interesting, and up-to-date. Little research has been done on the effect of nudges on dietary intake, which is why this research is important for growing the field, but the research that has been done shows that it is effective. Also, ‘smart’ aspects to the programs have been shown to be advantages to online programs.

Cooking meals at home as well as meal preparation and planning are successful in leading to a healthier lifestyle and eventually aiding with losing weight. This research will examine the nudge interventions specifically focused on meal preparation, cooking at home, and increasing fruit and vegetable

consumption to improve meal planning and dietary intake among participants in an online meal planning group.

Chapter Three: Methodology

Research Design

This study was designed to see if sending weekly nudges focusing on dietary goals improves meal planning and dietary intake in an online meal planning group. Data collected included: questions about fruits, vegetables, beverages, and fast food consumption, and nudge responses. The online meal planning and preparation group intervention included people living in Lexington, Kentucky. This research project followed an intervention randomized control trial study design with a six-week completion during the spring season of 2019.

Participants/Sampling

The online meal planning group was offered through the social media platform of Facebook. Participants were recruited for the program through Facebook. Women self selected to be in this meal planning and preparation online group. This Facebook group was used to recruit women to participate in additional message nudging intervention. Participants received a $50 Kroger gift card for participating for the entirety of the program.

The sample population were women aged from 20 to 60 years old who lived in Lexington, Kentucky. Recruitment of the participants was done through social media directly from the online meal planning group. For a person to be eligible to participate in the study, they must have been in the meal planning

Facebook group, speak English fluently, aged 20 to 60 years old, and a woman. The sample size included 18 women.

Measurements

A pre- and post-survey was collected to measure independent and dependent variables. The pre-survey was given to participants during week one of the program and the post-survey was given at the end of week six. The questions on the pre- and post-survey were adapted from an article from the Public Health Nutrition Journal. The article was written by Melissa N. Laska and entitled *How we eat what we eat: Identifying meal routines and practices most strongly associated with healthy and unhealthy dietary factors among young adults*. The pre- and post-survey questions are located in Appendix A.

Nudges were also used to collect additional data. The nudges were developed by researchers involved in the study. Main topics of the nudges were first developed, then the question. A post in the Facebook group was sent once a week on a Friday afternoon during the six-week study giving the group a nudge about one of their goals that they were trying to achieve for that week. A follow-up nudge was sent the following Wednesday afternoon to see how they were doing with their goal for the week. The six nudges along with the follow-up messages are located in Appendix B.

Depending on how the participant responded to the nudge, there was a score assigned to it. If they did not respond, they received a 0. If they did respond, they received a 1. For the follow up nudges, they received a 0 if they

did not respond or if they responded and did not complete their goal. They received a 1 if they did respond and completed their goal.

Statistical Analysis

Data based on the pre- and post-survey answers and the nudges were entered into Microsoft Excel. Stata 16.0 was used for statistical analysis. For the pre- and post-survey answers, descriptive statistics included means, plus standard error and 95% confidence intervals for each variable. Separate tests were run to find the correlations between the pre-survey and the post-survey answers. Lastly, a regression analysis was performed to see if there was an association between selected pre- and post-survey results, based on the previous correlations.

Chapter Four: Results

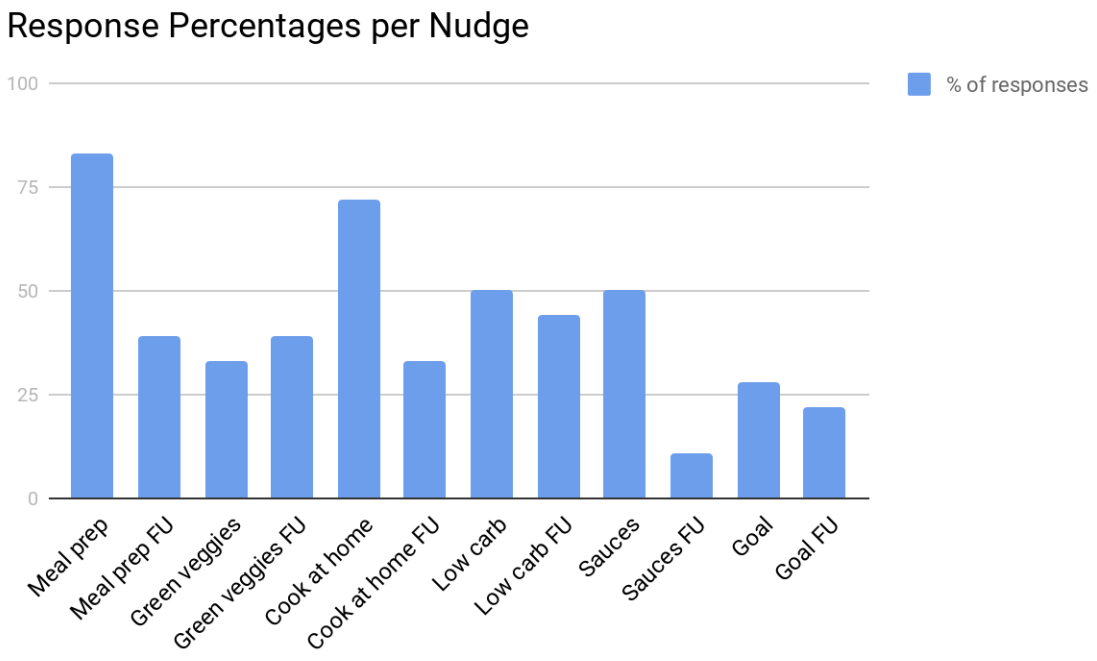
Seventeen of the 18 participants responded to a nudge at least once during the six-week period of the study. 100% of the sample were middle-aged caucasian women as shown in Table 1 below.

Table 1: Demographics

Demographics	**Total Percentage**
Race	
White	100%
Average Age in Years	40
Gender	
Female	100%

Figure 1 represents the percentage of responses per nudge each week. Responses were considered either liking the post or commenting on it. The nudge on the left is the first nudge sent to the participants followed by the follow-up nudge next to it. The nudges are in the order they were sent in from left to right. The labels for the nudges are the general theme of that specific nudge. The nudges, along with their general theme names are located in Appendix B.

Figure 1: Response Percentages per Nudge

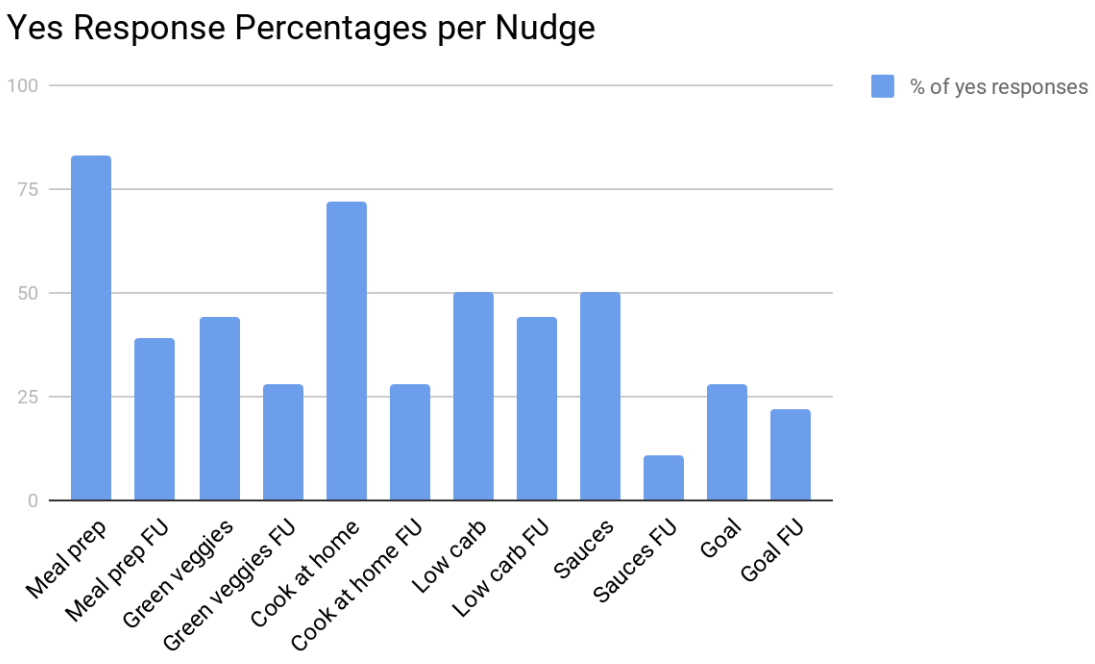


From left to right, the percentages are as followed; Meal prep 83%, Meal prep FU 39%, Green veggies 33%, Green veggies FU 39%, Cook at home 72%, Cook at home FU 33%, Low carb 50%, Low carb FU 44%, Sauces 50%, Sauces FU 11%, Goal 28%, and Goal FU 22%. The highest percentage of responses was 83% on the first nudge, which was focused on meal preparation. The lowest

was 11% on the third to last nudge, which was the follow-up nudge focused on sauces. Although the percentages fluctuated throughout the six weeks, there was a gradual decline of responses.

Figure 2 represents the percentage of yes responses per nudge each week. It was considered a yes response if the participant commented on the post and said that they were able to complete their goal. This means that the person responding to the nudge said that they could complete the goal or they did complete the goal for that week. The same labels for the nudges were used as the previous graph.

Figure 2: Yes Response Percentages per Nudge



From left to right, the percentages are as followed; Meal prep 83%, Meal prep FU 39%, Green veggies 44%, Green veggies FU 28%, Cook at home 72%, Cook at home FU 28%, Low carb 50%, Low carb FU 44%, Sauces 50%, Sauces FU 11%, Goal 28%, and Goal FU 22%. The highest percentage of yes responses was 83% on the first nudge, which was focused on meal preparation. The lowest was 11% on the third to last day, which was the follow-up nudge focused on sauces. The highest and lowest percentage of yes responses were the same as the overall responses. Although the percentages fluctuated throughout the six weeks, there was a decline in the percentage of yes responses.

The percentages from the yes responses were very similar to the percentages of all responses to the nudges. This means that most people positively responded to the nudge and completed their assigned goal for that week.

Table 2 represents the themes for each nudge that were found from the comments made by the participants on the Facebook posts. Some of the themes are just from one participant and some are a summary of multiple comments from different participants. The themes were found and summarized by the researchers. Sometimes there were no comments on the posts or just a few. This is why some boxes are blank.

Table 2: Nudge Themes

Nudge	**Theme 1**	**Theme 2**	**Theme 3**
Meal prep	Go shopping on Sunday based on plan for the week	Plan Friday and finalize Saturday to go shopping	Save money and eat healthier
Meal prep FU	Right on track	Best week of eating in a long time	Utilizing leftovers
Green veggies	Use Kroger ClickList	Try roasted veggies	Try veggies in an air fryer
Green veggies FU	Made several meals with roasted veggies	Keep steamable veggies bag in the freezer	-
Cook at home	Use the crockpot to help	Trying 4 nights and then leftovers	No problem completing this
Cook at home FU	Made it Monday through Thursday	Was able to because of shopping on the weekend and having a plan	Not able to because of birthday
Low carb	Trying zoodles	Steak with salad and green beans	Steak with cauliflower rice
Low carb FU	Roasted asparagus and cauliflower	Shrimp, asparagus, and cauliflower rice	Cauliflower pizza with shrimp and arugula
Sauces	Olive oil and balsamic vinegar for dressing	Makes dressings at home to avoid fillers and preservatives	Made salad dressing for the week
Sauces FU	-	-	-
Goal	Prepping lunch and snacks for more than three days	Get back on track after spring break	Eat normal breakfast and lunch on spring break
Goal FU	Get back into meal planning after spring break	Make energy bites	Try energy bites for kids

Table 3 below shows the means, plus standard error and 95% confidence intervals of the answers from the pre- and post-survey questions.

Table 3: Means of Key Variables

Variable	**Pre Mean (St Error)**	**95% CI**	**Post Mean (St Error)**	**95% CI**
Fruit	4.50 (1.07)	(2.17, 6.83)	4.65 (1.09)	(2.29, 7.02)
Beans	1.88 (0.30)	(1.24, 2.53)	2.85 (0.44)	(1.88, 3.81)
Dark greens	5.31 (0.90)	(3.34, 7.28)	6.88 (1.25)	(4.16, 9.61)
Orange veggies	2.12 (0.31)	(1.44, 2.79)	2.46 (0.40)	(1.59, 3.34)
Other veggies	6.65 (1.03)	(4.41, 8.90)	8.15 (1.46)	(4.97, 11.33)
Preparing meals at home	5.62 (0.26)	(5.05, 6.18)	5.77 (0.30)	(5.12, 6.18)
Preparing meals your own	4.88 (0.89)	(3.50, 6.50)	5.42 (1.69)	(3.50, 10.00)
Preparing meals w/ veggies	6.08 (0.76)	(4.50, 7.00)	6.77 (1.22)	(4.50, 10.00)
Fast food	1.19 (1.05)	(0.90, 3.23)	0.88 (0.65)	(0.85, 1.10)

Table 4 below represents the relationships between the pre-survey questions. The values greater than r=0.4 were found to have a positive correlation. The results indicate that at the beginning of the six-week intervention, the participants were: eating other vegetables while preparing meals with a vegetable, eating other vegetables when preparing meals at home, eating dark

greens when preparing meals at home, eating dark green vegetables as well as other vegetables, eating beans while preparing meals with vegetables, eating fruit while preparing meals with vegetables, eating fruit while preparing meals at home, eating fruit as well as other vegetables, eating fruit as well as orange vegetables, and eating fruit as well as dark green vegetables.

Table 4: Pre-Survey Correlations

	Pre Fast Food	Pre Preparing Meals w/ Veggies	Pre Preparing Meals your own	Pre Preparing Meals at home	Pre Other Veggies	Pre Orange Veggies	Pre Dark Greens	Pre Beans	Pre Fruit
Pre Fast Food	1.00								
Pre Preparing Meals w/ Veggies	-0.20	1.00							
Pre Preparing Meals your own	-0.28	-0.23	1.00						
Pre Preparing Meals at home	0.08	0.31	0.29	1.00					
Pre Other Veggies	-0.32	0.41*	0.28	0.65*	1.00				
Pre Orange veggies	0.16	0.18	-0.59	0.28	0.06	1.00			
Pre Dark Greens	0.07	0.14	-0.29	0.42*	0.48*	0.29	1.00		
Pre Beans	0.25	0.42*	-0.48	-0.07	-0.01	0.34	-0.21	1.00	
Pre Fruit	0.06	0.58*	-0.38	0.54*	0.65*	0.56*	0.58*	0.33	1.00

Table 5 represents the relationships between the post-survey questions. The values greater than r=0.4 were found to have a positive correlation. The results indicate that at the end of the six-week intervention, the participants were: eating more dark green vegetables as well as other vegetables, eating more dark greens when preparing meals at home, eating more beans when preparing their own meals, and eating more beans when preparing a meal with vegetables.

Table 5: Post-Survey Correlations

	Post Fruit	Post Beans	Post Dark Greens	Post Orange Veggies	Post Other Veggies	Post Preparing Meals at home	Post Preparing Meals your own	Post Preparing Meals w/ Veggies	Post Fast Food
Post Fruit	1.00								
Post Beans	-0.02	1.00							
Post Dark Greens	0.39	-0.32	1.00						
Post Orange Veggies	0.29	-0.46	0.12	1.00					
Post Other Veggies	0.14	-0.12	0.54*	0.27	1.00				
Post Preparing Meals at home	0.27	-0.30	0.50*	0.14	0.21	1.00			
Post Preparing Meals your own	-0.13	0.66*	-0.33	-0.66	-0.50	-0.24	1.00		
Post Preparing Meals w/ Veggies	0.37	0.64*	-0.32	0.08	-0.25	0.05	0.38	1.00	
Post Fast Food	-0.10	-0.38	0.33	0.39	0.24	0.32	-0.44	-0.19	1.00

A regression analysis was performed to determine if there was an association between any pre- and post-survey results, based on the correlations from Tables 4 and 5. Table 6 represents the data from this regression analysis between preparing meals at home, preparing your own meals, and fast food consumption. Because these three questions were positively correlated, they were chosen for the analysis. Table 6 shows the beta-coefficient and 95% confidence interval of these relationships. The values with an asterisk are shown to be significant based on an alpha of 0.05 or less.

Table 6: Regression Analysis

	Coefficient	95% Confidence Interval
Pre vs. Post Preparing Meals at home	0.98*	(0.59, 1.37)
Pre vs. Post Preparing Meals your own	0.82	(-0.31, 1.96)
Pre vs. Post Fast Food	0.32	(-0.03, 0.67)

The first regression test on pre- and post-question answers, preparing a meal at home, found a significant change of about one time per week increase in preparing meals at home between baseline and intervention.

The second regression test on pre- and post-question answers, preparing your own dinner, was not significant. The third regression test on pre- and post-survey question answers, fast food frequency, was also not significant.

Chapter Five: Discussion

The purpose of this study was to see if sending weekly nudges focusing on dietary goals improved meal planning and dietary intake in an online meal planning and preparation group.

The first aim of this study was to determine if those who responded more frequently to nudges consumed more fruits and vegetables compared to those who did not respond as frequently. The aim was met by collecting the frequency of nudges as well as the consumption of fruits and vegetables.

The second aim of this study was to see if those who received nudges of meal preparation improved their food shopping practices including eating out, purchasing fruits and vegetables, and meal preparation. This aim was met by collecting the frequency of nudges as well as data on fast food frequency, fruit and vegetable consumption, and meal preparation habits.

The key finding of this research was that meal planning appears to have a significant effect on meal preparation at home and thus may help improve dietary intake.

From data collected from the nudges, both the percentage of responses and percentage of yes responses gradually declined throughout the six-weeks of the program. This is supported in a previous study conducted by Mutsuddi that indicates the novelty of the program may have died down after the initial start of the program (Mutsuddi, 2012). A study conducted by van Beurden, showed that when creating an online weight loss program it should be personal, be updated, have little effort, be motivating, be supporting, and collaborate with face-to-face

support (van Beurden, 2018). van Beurden also found some barriers in creating an online program which included effort, time and commitment, lack of novel or useful information, accessibility and disposability, email reminders, and perceived target group and appeal of website (van Beurden, 2018). It is important to keep all of these factors in mind when creating future programs and interventions so the participants are motivated to complete their goals.

Also, for most of the follow-up nudges, there was always a decrease in response from the first nudge to the follow-up nudge. This may be because participants knew they would complete their assigned goal for the week and did not need to be reminded.

As the study went on, participants began to interact with each other. There were some common themes found from the comments made on the Facebook posts. Most participants agreed that planning out meals ahead of time and preparing meals for the week were helpful in saving time, saving money, and helping them eat healthier. Common foods people liked to make were cauliflower rice and pizza crust, asparagus, zoodles, and salad. Additionally, numerous participants liked to make their own salad dressings at home. Many of the women liked to share what they were planning or making for the week. This may have motivated other participants if they needed inspiration for meals to make for the week.

Correlation tests were performed to look at the relationships between the variables of the pre-survey answers and post-survey answers. The correlation coefficient provided information regarding the degree to which the variables were

related. There could be a positive or negative correlation. A value of 0.40 or greater was considered a significant correlation. There was a significant change between the pre- and post-survey results of about one time per week increase in preparing meals at home between baseline and post intervention. As discussed previously, meal planning appears to have a significant effect on meal preparation at home and other lifestyle factors. A study conducted by Kruger found that self-monitoring strategies such as planning meals may be important in successful weight loss maintenance (Kruger, 2006). Also, Appelhans concluded that in midlife women, longer meal preparation/cleanup time is associated with the development of a positive cardiometabolic risk profile (Appelhans, 2015).

The other meal preparation variables analyzed were not significant. This could be because people may choose fast food for dinner if they do not have a pre-planned dinner.

Strengths and Limitations

A strength of this study is that this preliminary data can be used to improve future online programs and help participants become more successful in their healthy lifestyle journey. Future research can build upon the positive correlations that were found.

There are several limitations to this study. First of all, there were very few participants in the study and not all of them responded to all of the nudges throughout the study. Secondly, the study lacks diversity. The population is only middle-aged caucasian females from one specific location. Therefore, the study also lack generalizability. Also, the availability of food and certain foods that are

considered healthy is impacted by this. Another limitation is that one week of the study was conducted during the spring break of the participant's children. This did inhibit some of the participants from completing their goals because of a change in everyday patterns, such as watching their children or traveling on vacation. Also, our selected population was already in this online meal planning and preparation group. This might have affected our results because they were already practicing meal preparation habits before the study was conducted. This suggests that a more diverse audience may result in different study outcomes.

Implications

There are many public health implications that can be made from the results. From previous literature, we know that technology, especially smartphones and applications, is becoming very popular and can be useful in healthcare. Nowadays, people live very busy lives and are always on the go. Therefore, they are needing constant reminders and assistance for meeting their goals in general but particularly health goals. For example, it is not enough for someone to go to their doctor and be told to do something once every three months. Having constant reminders or nudges sent to them in between doctor visits can help improve their outcomes. With the information found in this study, this could be applied to healthy eating. Receiving nudges can be a constant reminder to people to cook dinner at home, remember to meal prep, and more.

Recommendations for Future Studies

This study should be expanded in future research. A larger and more diverse audience should participate to be able to apply generalizability. Lower

income and lower socioeconomic status populations may have different results because they are possibly not practicing meal preparation patterns as in this study.

A specific recommendation would be to conduct trials during different times of the year and sending the nudges on different days and at different times. This study was conducted during the spring season. Spring break affected our participants completion of their goals, which in turn affected our results. Nudges were sent on Friday afternoons and follow-up nudges on Wednesday afternoons. It could be worthwhile to look at sending nudges and follow-ups on different days and looking at specific times of the day for the most amount of responses.

This type of research could also be applied to weight loss and other medical programs and continue their research to improve their outcomes.

Since this was a pilot study, these results are now being used in an expansion study. There will be an application developed for smartphones that will send nudges about meal preparation and planning to participants. This should improve meal planning and dietary intake for this new population.

Conclusion

This pilot idea of sending nudges to people to improve meal planning and dietary intake proves to be good direction. It is potentially beneficial for meal planning and preparation groups and can be expanded to online weight loss programs, health care, and other motivation-needed situations. Nudges will help remind people to stay on track when trying to achieve specific goals and outcomes.

From the results of this study, we can conclude that the use of technology in an online meal planning and preparation group can improve meal planning and dietary intake. This can then be used to encourage and assist in healthy lifestyle journeys.

Appendices

Appendix A: Pre and Post Survey Questions

- Fruit: During the past month, not counting juice, how many times per day, week, or month did you eat fruit?
- Beans: During the past month, how many times per day, week, or month did you eat cooked or canned beans, such as refried, baked, black, beans in soup, soybeans, edamame, tofu or lentils?
- Dark greens: During the past month, how many times per day, week, or month did you eat dark green vegetables for example broccoli or dark leafy greens including romaine, chard, collard greens or spinach?
- Orange veggies: During the past month, how many times per day, week, or month did you eating orange-colored vegetables such as sweet potatoes, pumpkin, winter squash, or carrots?
- Other veggies: Not counting what you just told me about, during the past month, about how many times per day, week, or month did you eat other vegetables?
- Preparing meals: On a scale of 0-7 days, how many days did you prepare …
    a. Preparing meals at home: A meal at home?
    b. Preparing meals your own: Your own dinner?
    c. Preparing meals w/ veggies: A meal with vegetables?
- Fast food: How many times in the past week did you eat a meal at a fast food restaurant (like McDonald's, Burger King, Hardee's, etc.)?
    a. 1-2 times
    b. 3-4 times
    c. 5-6 times
    d. 7 or more times

Appendix B: Nudges

- Meal prep (Week 1 Question): Do you plan on meal prepping this Sunday for this coming week?
- Meal prep follow up (Week 1 Follow Up Question): To follow up on Sunday's question, how did planning out your meals on Sunday for this week go so far?
- Green veggies (Week 2 Question): Maybe your goal for this coming week could be to include green vegetables into your meals. Does that seem doable? This is a recipe I like to make during the week but can also be used for meal prepping on a Sunday. I love this roasted chicken and veggies because it has so many colors and tastes delicious! https://gimmedelicious.com/2016/03/22/15-minute-healthy-roasted-chicken-and-veggies/?fbclid=IwAR2fO5K8lYtVbMuyN_KpqdqEB_RHtSNV9ih5SgYx_qG7ZDk4zTbu5DhIbP4
- Green veggies follow up (Week 2 Follow Up Question): For those of you who made the goal of including green veggies into your meals this week, how is that going so far?
- Cook at home (Week 3 Question): Meal planning can help save money at the store and limit eating out at restaurants or getting fast food. What about a goal of cooking at home at least five times for this coming week? Is that realistic?
- Cook at home follow up (Week 3 Follow Up Question): For those of you who are trying to reach the goal of cooking at home five times this week, how is it going and do you think you are going to meet the goal?
- Low carb (Week 4 Question): Here is next week's goal: add a low carb main meal this week. Do you think you'll be able to achieve this goal? Zucchini noodles are a great option for a low carb main meal instead of pasta. You can make them at home or buy already made spirals of zucchini!
- Low carb follow up (Week 4 Follow Up): How is the goal of adding a low carb meal this week going? Cauliflower rice is another great alternative to make a meal low carb! Like zucchini noodles, you can make your own cauliflower rice at home or buy already made riced cauliflower.
- Sauces (Week 5 Question): Many sauces, marinades, and dressings have added sugars in them that we sometimes overlook. A goal for this week could be to try to make a sauce at home so you can still enjoy a favorite sauce without the added sugars. Here is a link to 17 healthier condiments and sauces to try! It has examples of items to buy at the store as well as homemade recipes! https://greatist.com/health/healthy-condiments-pantry-staples?fbclid=IwAR0Oxz5VCfsUasurexC-dh9AT0WfJZ7twIo0FwJQmqAhCPpAItVeStN5Lnw
- Sauces follow up (Week 5 Follow Up Question): How is making a sauce at home going this week? I am planning on making this homemade salsa tomorrow night for the basketball game! https://everydaysavvy.com/easy-

healthy-salsa-recipe/?fbclid=IwAR1HsQzwoIWk8Qe6olBvsaJNQoBrBxkoPqG-HI3R_zDTuZFXH50dVlbPYhA

- Goal (Week 6 Question): This will be the last goal for this coming week! What is a meal prepping goal for yourself that you will be able to maintain? I have two goals for myself. One goal is to go out to eat twice a week at the most. Another goal is to add variety to my meal prep on Sundays so I don't get bored with chicken, rice, and veggies.
- Goal follow up (Week 6 Follow Up Question): I hope planning goals to maintain meal prepping is going well! Here are a few more goals I have thought of. Keep commenting your goals and ideas to support and inspire others!
    a. Don't forget about meal prepping snacks too! These 'Trailblazer Bites' have been my favorite snack to meal prep lately! https://www.traderjoes.com/recipes/lunch/trailblazer-bites
    b. Keep a list (or Pinterest board) of favorite meal prep recipes so you do not have to search for ideas when it's Sunday night.
    c. Make a list of the ingredients you need for meal prepping and stick to it when going to the grocery store.

REFERENCES

Allen, J. K., Stephens, J., & Patel, A. (2014). Technology-Assisted Weight Management Interventions: Systematic Review of Clinical Trials. *Telemedicine and E-Health, 20*(12), 1103-1120. doi:10.1089/tmj.2014.0030

Appelhans, B. M. (2015). Meal preparation and cleanup time and cardiometabolic risk over 14 years in the Study of Women's Health Across the Nation (SWAN). *Preventive Medicine, 71*, 1-6. Retrieved November 4, 2018, from https://www-sciencedirect-com.ezproxy.uky.edu/science/article/pii/S009174351400468X?via=ihub.

Bashi, N. et al. (2018). Self-Management Education Through mHealth: Review of Strategies and Structures. *JMIR Mhealth Uhealth,* 6(10). Retrieved November 4, 2018 from https://mhealth.jmir.org/2018/10/e10771/

Befort, C. A. (2012). Prevalence of Obesity Among Adults from Rural and Urban Areas of the United States: Findings from NHANES (2005-2008). *The Journal of Rural Health, 28*(4), 392-397. Retrieved October 8, 2018, from https://www-ncbi-nlm-nih-gov.ezproxy.uky.edu/pmc/articles/PMC3481194/.

Cole-Lewis, H., & Kershaw, T. (2010). Text Messaging as a Tool for Behavior Change in Disease Prevention and Management. *Epidemiologic Reviews*, *32*, 56–69. Retrieved from https://www-ncbi-nlm-nih-gov.ezproxy.uky.edu/pmc/articles/PMC3082846/

Gustafson, A. et al. (2019). A Mentor-Led Text-Messaging Intervention Increases Intake of Fruits and Vegetables and Goal Setting for Healthier Dietary Consumption among Rural Adolescents in Kentucky and North Carolina, 2017. *Nutrients*, *11*(3), 593. Retrieved from https://www-ncbi-nlm-nih-gov.ezproxy.uky.edu/pmc/articles/PMC6471255/

Hales, C. M., M.D. et al. (2017). Prevalence of Obesity Among Adults and Youth: United States, 2015-2016. *NCHS Data Brief,* 1-8. Retrieved October 3, 2018, from https://www.cdc.gov/nchs/data/databriefs/db288.pdf.

Holmes, W. S. et al. (2018). Impact of digital technologies for communicating messages on weight loss maintenance: A systematic literature review. *European Journal of Public Health*. Retrieved October 8, 2018, from https://academic-oup-com.ezproxy.uky.edu/eurpub/advance-article-abstract/doi/10.1093/eurpub/cky171/5100736?redirectedFrom=fulltext.

Hutchesson, M. J. et al. (2016). Enhancement of Self-Monitoring in a Web-Based Weight Loss Program by Extra Individualized Feedback and Reminders: Randomized Trial. *Journal of Medical Internet Research, 18*(4), 82nd ser. Retrieved December 10, 2018, from https://www-ncbi-nlm-nih-gov.ezproxy.uky.edu/pmc/articles/PMC4846785/.

Kruger, J., Blanck, H. M., & Gillespie, C. (2006). Dietary and physical activity behaviors among adults successful at weight loss maintenance. *International Journal of Behavioral Nutrition and Physical Activity, 3*(17). Retrieved November 7, 2018, from https://www-ncbi-nlm-nih-gov.ezproxy.uky.edu/pmc/articles/PMC1555605/.

Laska, M. N. et al. (2015). How we eat what we eat: Identifying meal routines and practices most strongly associated with healthy and unhealthy dietary factors among young adults. *Public Health Nutrition,18*(12), 2135-2145. Retrieved October 7, 2018, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5567832/.

Lee-Kwan SH et al. (2017). Disparities in State-Specific Adult Fruit and Vegetable Consumption — United States, 2015. MMWR Morb Mortal Wkly Rep 2017;66:1241–1247. DOI: http://dx.doi.org/10.15585/mmwr.mm6645a1.

Lin, P. et al. (2015). Adaptive intervention design in mobile health: Intervention design and development in the Cell Phone Intervention for You trial. *Clinical Trials: Journal of the Society for Clinical Trials,12*(6), 634-645. doi:10.1177/1740774515597222

Mills, S. et al. (2017). Frequency of eating home cooked meals and potential benefits for diet and health: cross-sectional analysis of a population-based cohort study. *International Journal of Behavioral Nutrition and Physical Activity*, *14*, 109. Retrieved from https://www-ncbi-nlm-nih-gov.ezproxy.uky.edu/pmc/articles/PMC5561571/

Mutsuddi, A. U., & Connelly, K. (2012). Text messages for encouraging physical activity are they effective after the novelty effect wears off? *2012 6th International Conference on Pervasive Computing Technologies for Healthcare (PervasiveHeath) and Workshops*. Retrieved October 4, 2018, from https://ieeexplore.ieee.org/abstract/document/6240360.

Napolitano, M. A. et al. (2013). Using facebook and text messaging to deliver a weight loss program to college students. *Obesity Journal, 21*(1), 25-31. Retrieved February 18, 2019, from https://onlinelibrary-wiley-com.ezproxy.uky.edu/doi/epdf/10.1002/oby.20232 .

Newton, R. L., Jr. (2018). A Church-Based Weight Loss Intervention in African American Adults using Text Messages (LEAN Study): Cluster Randomized Controlled Trial. *Journal of Medical Internet Research, 20*(8). Retrieved October 8, 2018, from https://www-ncbi-nlm-nih-gov.ezproxy.uky.edu/pmc/articles/PMC6128956/.

Overweight & Obesity. (2018, March 05). Retrieved November 4, 2018, from https://www.cdc.gov/obesity/adult/causes.html

Thomas, J. G. et al. (2017a). Weight loss and frequency of body-weight self-monitoring in an online commercial weight management program with and without a cellular-connected 'smart' scale: A randomized pilot study. *Obesity Science & Practice, 3*(4), 365-372. Retrieved December 10, 2018, from https://www-ncbi-nlm-nih-gov.ezproxy.uky.edu/pmc/articles/PMC5729493/.

Thomas, J. G. et al. (2017b). Weight loss in Weight Watchers Online with and without an activity tracking device compared to control: A randomized trial. *Obesity, 25*(6), 1014-1021. doi:10.1002/oby.21846

Van Beurden, S. B. et al. (2018). Informing the development of online weight management interventions: A qualitative investigation of primary care patient perceptions. *BMC Obesity, 5*(7). Retrieved October 8, 2018, from https://www-ncbi-nlm-nih-gov.ezproxy.uky.edu/pmc/articles/PMC5810085/pdf/40608_2018_Article_184.pdf.

Vanderlee, L. (2018). Grocery Shopping, Dinner Preparation, and Dietary Habits among Adolescents and Young Adults in Canada. *Canadian Journal of Dietetic Practice and Research,* 1-7. Retrieved November 5, 2018, from http://dcjournal.ca/doi/abs/10.3148/cjdpr-2018-025?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub=pubmed&

Wang, M. L. et al. (2017). Clinic Versus Online Social Network-Delivered Lifestyle Interventions: Protocol for the Get Social Noninferiority Randomized Controlled Trial. *JMIR Research Protocols, 6*(12). Retrieved October 8, 2018, from https://www-ncbi-nlm-nih-gov.ezproxy.uky.edu/pmc/articles/PMC5742659/?report=printable.

Waring, M. E. et al. (2016). Interest in a Twitter-delivered weight loss program among women of childbearing age. *Translational Behavioral Medicine, 6*(2), 277-284. Retrieved November 4, 2018, from https://www-ncbi-nlm-nih-gov.ezproxy.uky.edu/pmc/articles/PMC4927447/.

Waring, M. E. et al. (2018). Feasibility and Acceptability of Delivering a Postpartum Weight Loss Intervention via Facebook: A Pilot Study. *Journal of Nutrition Education and Behavior, 50*(1), 70-74. Retrieved February 18, 2019, from https://www-clinicalkey-com.ezproxy.uky.edu/#!/content/playContent/1-s2.0-S1499404617309442?returnurl=https://linkinghub.elsevier.com/retrieve/pii/S1499404617309442?showall=true&referrer=https://www.ncbi.nlm.nih.gov/.

Weight and obesity. (2019, March 27). Retrieved November 23, 2019, from https://www.womenshealth.gov/healthy-weight/weight-and-obesity

Wolfson, J. A., & Bleich, S. N. (2014). Is cooking at home associated with better diet quality or weight-loss intention? *Public Health Nutrition, 18*(08), 1397-1406. doi:10.1017/s1368980014001943

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