EFFECTIVENESS OF THE HEALTHY DIABETES PLATE AND SOCIAL

MEDIA PROJECT

A Thesis

Presented in Partial Fulfillment of the Requirements for the

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AUTHORIZATION TO SUBMIT THESIS

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Family and Consumer Sciences and titled, "Effectiveness of the Healthy Diabetes Plate and
Social Media Project" has been reviewed in final form. Permission, as indicated by the
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ABSTRACT

Twenty-eight participants completed an eight week diabetes meal planning program called the Healthy Diabetes Plate (HDP) and Social Media (SM) Project. It focused on (1) ability to plan diabetes meals, (2) eating behaviors and self-efficacy, (3) diabetes signs and symptoms and (4) Facebook and Pinterest. Mixed methods –quantitative (Pearson's chi-square analyses and frequencies) and qualitative analyses (HDP social media pages)–were used. Participant's knowledge or ability to plan diabetes meals increased from lesson 1 (79%) to lesson 3 (93%). From pre- to post-study, there was a significant increase in the number of participants who found diabetes meal planning to be easy, and a significant increase in their self-efficacy scores, their ability to eat out at restaurants and purchase foods while still following their diabetes meal plan. Fifty percent of participants used SM activities to help them plan meals (46.4%), finding recipes (28.6%), and (3) assist when dining out (21.4%).

ACKNOWLEDGEMENTS

DEDICATION

I want to thank my girlfriend, parents, grandparents and friends for being so supportive during this process. I would also like to thank Dr. Samantha Ramsay, Dr. Katie Miner and Dr. Katie Brown at the University of Idaho for being such a positive influence in my life beyond academics and supporting me during my time in Moscow, ID.

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Type 2 diabetes is a major threat to the public's health in the United States (Centers for Disease Control and Prevention, 2014). According to the 2014 National Diabetes Statistics Report, it is estimated that a total of 29.1 million people in the United States have diabetes or 9.3% of the population (Centers for Disease Control and Prevention, 2014). Diabetes self-management (DSM) is multifaceted and requires many lifestyle changes (Beverly & Wray, 2010) such as weight loss (Rejeski et al., 2012), dietary habits and regular exercise (Saito et al., 2011) to obtain and maintain optimal glycemic control (Beverly & Wray, 2010). Diabetes control, achieved through changes in management practices can improve health outcomes and keep people with diabetes healthy (Centers for Disease Control and Prevention, 2014).

Improving an individual's DSM through education can help them control their blood glucose levels by teaching them about the benefits of exercise, losing weight, if necessary medication use and following a meal plan (Centers for Disease Control and Prevention, 2014). Meal planning is one of the most challenging components of diabetes management (Evert et al., 2014) and out of the many diabetes meal planning tools that do exist such as carbohydrate counting (Laurenzi et al., 2011), glycemic index (Amano et al., 2007) and exchange method (Smart, Aslander-van Vliet & Waldron, 2009), few target low literacy populations (Kandula et al., 2009). Understanding basic health information which includes diabetes management is a common problem in the United States where only 12 % of the population can obtain, comprehend and process basic health information to make proper health decisions (Koh & Rudd, 2015). The plate method targets low literacy populations by providing a simple visual approach to learning about diabetes meal planning (Proscia, 2014) that enhances understanding (Hersh, Salzman & Snyderman, 2015). It teaches people the types and amount

of foods they should be eating by dividing a plate into the various food groups (Camelon et al., 1998). Like the plate method, MyPlate uses a "plate" as an education tool, however it's food groups aren't designed for a diabetes population like the plate method.

For patients with diabetes, social media has been used to improve diabetes control (Petrovski, Zivkovic & Stratrova, 2015) by reducing hemoglobin A1c levels (Tima, Athanasiou, Harling, Darzi, & Ashrafian, 2014). Social media may also provide support and serve as a venue for individuals to share information, knowledge, connect with others and obtain information (Cooper & Kar, 2014). When social media is incorporated into the classroom, individuals use it as a way to remain connected with their instructors and enhance their learning (Orsini & Evans, 2015).

Therefore the purpose of this study was twofold: (1) to test a plate method curriculum called the Healthy Diabetes Plate on a diabetes population, and (2) to determine if social media is an effective educational tool.

STATEMENT OF THE PROBLEM

Managing diabetes is difficult because it is often associated with chronic health conditions. Many barriers exist that create challenges for the management of diabetes. These barriers include: ethnicity, heathy literacy skills, meal planning skills, urban and rural living, self-efficacy, etc. There is also limited research supporting the plate method as a meal planning tool for individuals with type 2 diabetes. In addition, social media has been used mostly for communication purposes and has not been used to reinforce educational materials such as the plate method.

SIGNIFICANCE OF THE PROBLEM

Face-to-face education provides the structure that individuals need as well interaction with peers but it has a limited reach. On the other hand, social media education provides convenience and reaches a wider audience. Being able to combine both face-to-face lessons as well as lessons through social media would help reinforce the material that is learned every week. In addition, helping population groups that can not attend weekly classes can also be solved through social media.

DEFINITION OF TERMS

Carbohydrate counting

A diabetes meal planning tool that individuals with diabetes use to meet their target number of carbohydrates by counting the grams of carbohydrates in the food they consume

(Kawamura, 2007).

Exchange list Method

A list or grouping of foods in which the carbohydrates, fats, protein and calories are similar in serving size. These lists are pubished by the American Diabetes Association and are used in meal planning for various diseases as well as weight reduction.

("Exchange Lists for Meal Planning", n.d.).

Facebook

A social utility that helps people share information and communicate more efficiently with

their friends, family and coworkers

(Mazeman & Usluel, 2010).

Glycemic index

A ranking of foods based on response of postprandial blood glucose levels as compared to a

reference food

("Glycemic Index", n.d.).

Health Literacy

A set of skills needed to understand basic health information and make proper health

decisions (Evert et al., 2014).

Hemoglobin A1c

A blood test that is used to determine average blood glucose levels over the past two to three

months by measures the among of glucose that has attached to red blood cells

(Lambeth, 2003).

Pinterest

Pinterest revolves around a "pin board" where users "pin" photos they find through the

internet and organize them into various categories

(Phillips, Miller & McQuarrie, 2014).

Plate method

A diabetes meal planning tool designed for the diabetes population that teaches the types and

amounts of foods to eat by dividing a plate into various food groups.

(Evert, et al., 2014).

Self-efficacy

The confidence that one can carry out a behavior necessary to reach a desired goal

(Bodenheimer, Lorig, Holman, & Grumbach, 2002).

Self-management

It is defined as the individual's ability to manage the symptoms, treatment, physical and

psychosocial consequences and lifestyle changes inherent in living with a chronic condition

(Barlow, Wright, Sheasby, Turner & Hainsworth, 2002).

Social media/networks

A range of applications that augments group interactions and shared spaces for collaboration,

social connections, and aggregates information exchanges in a web-based environment

(Bartlett-Bragg, 2006).

Type 2 diabetes

A condition characterized by hyperglycemia due to an initial stage of insulin resistance,

followed by a decrease in insulin production

(Centers for Disease Control and Prevention, 2014).

CHAPTER TWO: A REVIEW OF LITERATURE

INTRODUCTION

Type 2 diabetes is characterized by insulin resistance, a disorder in which the body's cells do not utilize insulin in an efficient manner. The result is an increase in blood glucose levels. It is a progressive disease, whereby, the pancreas gradually loses the ability to produce insulin (Centers for Disease Control and Prevention, 2012). Type 2 diabetes is a major threat to the public's health in the United States (Centers for Disease Control and Prevention, 2012). According to the 2014 National Diabetes Statistics Report, it is estimated that a total of 29.1 million people in the United States have diabetes or 9.3% of the population (Centers for Disease Control and Prevention, 2012). It is also the sixth leading cause of death in the United States (Shaw & Johnson, 2011). Most people with diabetes in the United States typically struggle with multiple health issues and complications. The major complications often associated with diabetes are heart disease and stroke, kidney failure, blindness and lower-limb amputations (Centers for Disease Control and Prevention, 2012). Complications from diabetes can be lessened or avoided through diabetes self-management. Factors that play a role in diabetes self-management include: (1) diabetes meal planning education (plate method, carbohydrate counting, exchange method, etc.), (2) demographics (race, gender, ethnicity, rural or urban location, and socioeconomic), (3) self-efficacy (meal planning and eating behaviors), and (4) use of social media (Facebook, education and social media, Pinterest and recipe sharing, and social medias impact on behavior change) in treating diabetes.

DIABETES MANAGEMENT AND EDUCATION

Self- management is defined as the individual's ability to manage the symptoms, treatment, physical and psychosocial consequences and lifestyle changes inherent in living with a chronic condition (Barlow, Wright, Sheasby, Turner & Hainsworth, 2002). For individuals with diabetes, it is referred to as diabetes self-management (DSM). It requires considerable lifestyle changes to several domains such as meal planning to achieve a healthy diet, exercising and glucose monitoring (Ricci-Cabello et al., 2014). Combining exercise with a modified diet is recommended for management of type 2 diabetes because it improves many risk factors that are associated with cardiovascular disease such as increased blood pressure, serum lipid concentrations and total cholesterol, LDL-cholesterol concentrations, serum triglycerides and decreased serum HDL-cholesterol concentrations (Klein et al., 2004).

Meal planning is one of the most challenging components of diabetes management (Evert et al., 2014). There are many diabetes meal planning tools that do exist such as carbohydrate counting (Laurenzi et al., 2011), glycemic index (Amano et al., 2007) and exchange method (Smart, Aslander-van Vliet & Waldron, 2009), none of these target low literacy populations (Kandula et al., 2009). Carbohydrate (carb) counting, targets grams of carbohydrates in a meal to obtain glycemic control. It helps individuals with diabetes adjust their insulin dosage around meals using insulin to carb ratio (Kawamura, 2007). However there are many barriers that can prevent this method from being effective. These barriers include: the effort and time required for individuals to invest in carbohydrate counting at each meal, understanding the strategy in general, and the availability of dietitians or appropriately trained health care providers to educate patients (Davis & Wylie-Rosett, 2008). In one study, the exchange method was compared to the healthy food choices meal plan (HFC) and found

that while both were equally effective; the simple approach to the HFC may be easier to understand. Like the carbohydrate method, the exchange method is difficult for many low literacy populations to understand which limits the full capability of these diabetes meal planning tools (Ziemer et al., 2003).

The plate method targets low literacy populations by teaching people the types and amounts of foods they should be eating by dividing a plate into various food groups (protein, grains, fruit, vegetables and dairy) (Camelon et al., 1998). The plate method is appropriate for individuals with type 2 diabetes whose primary goals are portion control and healthful eating patterns. The plate method for diabetes uses recommendations based on the American Diabetes Association (Evert et al., 2014).

The *"Healthy Diabetes Plate"* is a curriculum that has been used for diabetes meal planning (Raidl, et al., 2007). It was developed to teach individuals with diabetes the type and amount of foods that should be consumed at each meal using the plate method. The Healthy Diabetes Plate incorporates the guidelines set by the American Diabetes Association (Raidl, et al., 2007). In a study involving the Healthy Diabetes Plate curriculum 85-99% of participants were able to plan diabetes meals correctly and significantly increased their fruit and vegetable intake (Raidl, et al., 2007).

Diabetes education tools like the Healthy Diabetes Plate provide the meal planning information individuals with diabetes need (Raidl, et al., 2007). This can lead to changing habits and refining skills like goal setting, physical activity, diet, attitude and monitoring blood glucose levels (Rise, Pellerud, Rygg & Steinsbekk, 2013). Acquiring new life habits to properly self-manage diabetes should never be temporary, but rather long-term in order to

produce effective health outcomes (Haas et al., 2013). Often individuals are overwhelmed with information and are unable to use it to make positive life changes (Koh & Rudd, 2015). For this reason, diabetes educational tools like the plate method are important to target and use because they are so easy to understand. When education is easy to understand, it produces long term results and targets a wider diabetes population (Proscia, 2014; Hass et al., 2013). Every education setting has barriers that prevent people from receiving the full experience that was initially intended so determining an individual's educational level is an important part of the diabetes management process (Haas et al., 2013). When interpreting different population group needs like various ethnicities (Cornado et al., 2005), rural populations (Livaudais, et al., 2012), socioeconomic status (Seligman et al., 2010), etc., it is clear that the struggle to manage diabetes is very unique among individuals, no matter where they fit in the population (Haas et al., 2013).

Various population groups with type 2 diabetes differ in their ability to manage their diabetes (Yeung, Oh & Tang, 2014) due to their understanding of diabetes treatment (Coronado, Thompson, Tejeda & Godina, 2004). For example, African Americans are less likely to have regular checkups at the physician's office and order prescription medication refills, rely on emergency care and additionally have preventable hospitalizations (Yeung, et al., 2014). Cornado et al (2004) also points out that there is a growing body of research that claims Hispanics may experience and understand diseases differently from other population subgroups (Cornado et al., 2004).

Outreach to rural populations is also of major concern because residents in rural areas have less access to health care services, which includes diabetes care (Chretien & Kind, 2013). This may be due to having limited health coverage and living far from access to these

facilities (Livaudais, Thompson, Islas, Ibarra, Godina, & Coronado, 2010). Researchers that examined rural-urban differences in the prevalence of diabetes, discovered that misguided beliefs and frustrations about health and diabetes management are common among rural residents. Also they have limited choices of health services and are less likely than urban residents to receive regular checkups and preventive screenings (Krishna, Gillespie & McBride, 2010).

The lifestyle changes that are required for a self-managing patient with diabetes such as regular exercise, proper dietary habits and weight loss are easier said than done for many patients with diabetes (Beverly & Wray, 2010). Making lifestyle changes is related to a patient's self-efficacy which is defined as the confidence that one can carry out a behavior necessary to reach a desired goal (Bodenheimer, Lorig, Holman, & Grumbach, 2002). Like poor diabetes self-management, low self-efficacy can lead to poor glycemic control among individuals with type 2 diabetes (Al-Khawaldeh, Al-Hassan & Froelicher, 2012). In a study that measured self-efficacy, by implementing a Insulin Management Diabetes Self-Efficacy Scale (IMDSES) tool, Beverly & Wray (2010) found that participants had relatively high levels of self-efficacy in three sub categories (diet, insulin and general management) before being discharged from the program. It also found that participants with higher levels of self-effiacy were better able to manage their diabetes self-care (Beverly & Wray, 2010). Since diabetes is a self-managed disease it is no surprise that patients provide 99% of their own care (Feinglos & Bethel, 2008) which makes self-efficacy intervention strategies that much more important when trying to get them to change various life habits (Beverly & Wray, 2010).

The ability to self-manage diabetes can lead to better decision-making, self-care behaviors, problem-solving and collaboration with health care providers to improve clinical

outcomes, health status, and quality of life. There are many factors that can effect diabetes management (Funnel et al., 2011). Bohanny et. al., (2013) concluded that patients who were employed, received more diabetes-related education were more health literate and possessed greater self-efficacy, had less diabetes education and low health literacy skills than those who were unemployed. Higher health literacy and numeracy skills are each associated with greater diabetes self-efficacy, and greater diabetes self-efficacy is associated with lower Hemoglobin A1c levels (Osborn et al., 2010). In another study, related to food security it was discovered that mean self-efficacy scores were lower in food insecure individuals than food secure participants (Seligman, Davis, Schiller & Wolf, 2010) which again is an indicator of poor diabetes management (Bohanny et al., 2013).

Another barrier related to diabetes self-management is health literacy which is a set of skills needed to understand basic health information and make proper health decisions (Evert et al., 2014). A landmark 2006 report noted that only about 12% of US adults had proficient health literacy skills (Kutner, Greenburg, Jin & Paulsen, 2006). Another national assessment found that 56-65% of adult Americans over the age of 65 had low health literacy skills (Cronk, 2014). While examining health literacy and diabetes, Cox & Fletcher (2015) discovered that low healthy literacy was related to inadequate glycemic control and lower adherence to medication regime. In addition, patients with low health literacy generally have less knowledge about diabetes, exhibit inadequate self-management and have poor health outcomes (Evert et al., 2014; Koh & Rudd, 2012; Inoue, Takahashi & Kai, 2013; Rothman et al., 2004).These literacy limitations pose a risk to America's health and makes obtaining skills to manage diabetes even more difficult (Koh & Rudd, 2015).

One way to improve a patients understanding of the numerous skills needed for diabetes self-management could be through education. Education, which paves the way to better self-management, can help individuals control blood glucose levels by learning about the benefits of exercise, losing weight, if necessary medication use and following a meal plan (Centers for Disease Control and Prevention, 2014). Diabetes self-management (DSM) education provides services that are essential to the health and wellness of persons with diabetes, yet research indicates that these types of programs are underutilized by patients that could use it to their advantage. Research suggests that less than half of patients with diabetes receive DSM education (Coonrod, Betschart & Harris, 1994, US Department of Health and Human Services 2000). Reasons why this occurs include: lack of communication between patient and physicians, conflict between diabetes educators and physicians, struggle for DSM education programs to balance finances, and limited encouragement from physicians to patients (Peyrot & Rubin, 2008).

Traditional education offers information and teaches technical skills, whereas self-management education promotes problem-solving skills that improve quality of life (Bodeheimer, 2002). DSM education is a critical element of care for all people with diabetes and is necessary in order to improve patient outcomes (Funnel et. al., 2011). In a study that examined the relationships among self-efficacy, self-care and health literacy it was discovered that when participants increased their self-efficacy skills, they were more likely to have a better diet, increase their level of physical activity and monitor their blood glucose levels (Bohanny et. al., 2013).

SOCIAL MEDIA

Currently, communicating with patients face-to-face can be ineffective and patients are more likely to be engaged if social media is involved (Landro, 2014). Disengaged patients are difficult to manage and social media provides the messaging tools to reach out and encourage participation (Landro, 2014). It allows individuals to communicate with their health care providers (Campbell, Eichhorn, Early, Caraccioli & Greeley, 2012) while inspiring collaboration and participation (Antheunis, Tates & Nieboer, 2013). Use of social media is growing; in 2011, 67% of physicians used social media on a professional level and popularity is expected to continue to increase (Neuhauser, 2014). Facebook is the most common social platform used by the public with 1.49 billion users ("Facebook: monthly active users 2015 | Statistic", 2015). In 2011, Pinterest became the fastest social media site to reach 10 million users (Gilbert, Bakhshi, Chang, Terveen, 2013). Social media can be a quick, low-cost, direct way for nutrition educators to broaden the scope of their targeted programs (Tobey & Manore, 2014). It offers several advantages over other types of educational formats by overcoming barriers (i.e. family and home demands) and interactivity (Chu & Chan, 1998).

Technology has become very pervasive and people are relying on the internet for a variety of support (i.e. encouragement, relating with others) (Mani, Caiola & Fortuna, 2011). Young adults have grown up using computers and many other technologies and rely on it frequently as a tool to learn, interact, and socialize (Kindred, 2012). A substantial portion of the world's population use the internet daily i.e. by checking emails, chat-rooms, instant messaging, networking with others, etc. (Yee, Bailenson, Urbanek, Chang & Merget, 2007). It is one of the most popular tools that people use to access their health information and with a

sizeable increase in the incidence of chronic illness, internet access will better engage patients towards their health (Shaw & Johnson, 2011).

Smart phones have become an integral component of daily life for many people in the United States and the use of smartphone applications have already been shown to be a useful method for accurately logging and managing blood glucose levels (Tran, Tran & White, 2012). MyPlate is beginning to be utilized through mobile devices and applications. In a study involving college students (ages 18-24) it was determined, that for those that received information about MyPlate through text message reminders (app name is Mobile MyPlate), had greater food group recognition and improved knowledge of the dietary guidelines and increased fruit and vegetable consumption (Brown, O'Connor & Savaiano, 2014). It is important for health care providers to educate and inform patients about the availability of technology based resources to improve quality of life (Tran, Tran & White, 2012). Research by Brown, O'Connor & Savaiano (2014) discovered that participants who received daily text message reminders on their mobile devices had a stronger desire to use the application further because of the MyPlate information that was available to them.

Social media platforms like Pinterest and Facebook let individuals with diabetes connect with other people conveniently (Hernandez, 2015). Pinterest revolves around a "pin board" where users "pin" photos they find through the internet and organize them into various categories. Pinterest is unique because it is primarily visual (i.e. pictures), unlike many of other social media platforms which are text based (Phillips, Miller & McQuarrie, 2014). A social media campaign from the Oregon State University Extension Nutrition Education Program known as the Food Hero experience chose Pinterest as part of its campaign because of its effectiveness in reaching a target audience, it could be easily managed, do not require an

account to view content and it emphasized sharing and organizing photos onto pin boards.

Overall, it helped increase the amount and variety of vegetables and fruit consumed by

Oregonians (Tobey & Manore, 2014). Food recipes have been shared for hundreds of years

within different cultures and until somewhat recently they have emerged online (Lofgren,

2013). Lofgren (2013) argues food bloggers have contributed to the image-driven nature of

food-related media and that it has triggered the popularity of social media platforms like

Pinterest.

Facebook has tremendous potential to influence the world of health, such as providing

different types of general support which can include informational and emotional support, will

give users a wide variety of options (Zhang, He & Sang, 2013). Health care is one of

America's leading industries in terms of size and scope but is among the slowest to embrace

advances in communication and information technology (Hawn, 2009). Popular online social

media platforms such as Facebook can potentially be used to reach out to large numbers of

people to deliver health education and support (Shaw & Johnson, 2011).

Social media networks are starting to be recognized as significant support systems for

several chronic diseases, such as diabetes, which provide clinicians and many others with a

system to help understand and intervene with the growing diabetes epidemic (Mani, Cailoa &

Fortuna, 2011). Since Facebook acts like a forum it is convenient for people with diabetes to

receive feedback, acquire new information from others and offer personal experiences

(Greene et al., 2011).

Although the internet does not always provide reliable information, healthcare

professionals should embrace the technology that social media can provide. They can learn a

lot about the community of individuals with diabetes and provide their expertise by contributing content and sharing experiences (Cooper & Kar, 2014). Facebook's popularity has encouraged and developed a variety of disease-related Facebook groups online, which has given patients a chance to relate, interact and communicate with one another (Greene et al., 2011). In a study involving diabetes management, it was discovered that 15 of the largest found Facebook groups used Facebook for awareness but additionally to receive emotional support (Greene et al., 2011). Learning electronically and using social media tools, has the potential to build on many of its features that are more learner-generated, collaborative and engaging (Larvin, 2009) and can be utilized to improve knowledge, attitude, and skills (Cheston, Flickinger & Chisolm, 2013).

CONCLUSION

The plate method's simple visual approach can be an effective way to learn about diabetes meal planning and will help with healthful eating patterns and portion control, which is the plate method's primary goal (Evert et al., 2014). Individuals with type 2 diabetes will also improve their diabetes self-management if supplemented with strong, effective, social networks and support (Gallant, 2003; Rosland, et al., 2008; Schiotz, et al., 2012). Interventions through social media can improve glycemic control and improve a complex set of tasks that are required for people with diabetes such as: engaging in physical activity, checking blood glucose levels, following dietary advice (Vissenberg, et al., 2014) and dealing with the anxiety and stress that is often associated with diabetes self-management (Rosland et al., 2008). Of all the advantages that social media has to offer, there is still limited research and recognition on how useful diabetes education tools supplemented with social media can

be as a component of diabetes care (Merkel & Wright, 2012). Therefore, the purpose of this study is to evaluate the updated diabetes curriculum called "*The Healthy Diabetes Plate*" in addition to providing Facebook and Pinterest as a supplementary component to a diabetes population. This program will be evaluated to see if it improves (1) diabetes meal planning skills, (2) eating and self-efficacy behaviors, and (3) health outcomes of adults with type 2 diabetes.

CHAPTER 3: A JOURNAL ARTICLE

INTRODUCTION

Type 2 diabetes is a major threat to the public's health in the United States (Centers for Disease Control and Prevention, 2014). According to the 2014 National Diabetes Statistics Report, it is estimated that a total of 29.1 million people in the United States have diabetes or 9.3% of the population (Centers for Disease Control and Prevention, 2014). Diabetes self-management (DSM) is multifaceted and requires many lifestyle changes (Beverly & Wray, 2010) such as weight loss (Rejeski et al., 2012), dietary habits and regular exercise (Saito et al., 2011) to obtain and maintain optimal glycemic control (Beverly & Wray, 2010). Diabetes control, achieved through changes in management practices can improve health outcomes and keep people with diabetes healthy (Centers for Disease Control and Prevention, 2014).

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The plate method teaches people the types and amount of foods they should be eating by dividing a plate into the various food groups (Camelon et al., 1998). For patients with diabetes, social media has been used to improve diabetes control (Petrovski, Zivkovic & Stratrova, 2015) by reducing hemoglobin A1c levels (Tima, Athanasiou, Harling, Darzi, & Ashrafian, 2014). Social media may also provide support and serve as a venue for individuals to share information, knowledge, connect with others and obtain information (Cooper & Kar, 2014). When social media is incorporated into the classroom, individuals use it as a way to remain connected with their instructors and enhance their learning (Orsini & Evans, 2015).

Therefore the purpose of this study was twofold: (1) to test a plate method curriculum called the Healthy Diabetes Plate on a diabetes population, and (2) to determine if social media is an effective educational tool.

MATERIALS AND METHODS

HEALTHY DIABETES PLATE PROGRAM

The Healthy Diabetes Plate (HDP), is a four-lesson peer-reviewed, evidence based curriculum, which targets individuals with type 2 diabetes. It teaches diabetes meal planning skills and was originally published in 2003. Participants attending these classes learned about the diabetes "plate" method, i.e. how five diabetes food groups – vegetables, starches, protein, fruit, and dairy-fit on a plate (Figure 1). When tested, between 85-99% of participants correctly used this "plate" method to plan their meals in a variety of settings –home, grocery store, and eating out (Raidl et al., 2007).

Figure 1: The Original Healthy Diabetes Plate

In 2014, the HDP curriculum was updated to reflect the changes in the American

Diabetes Association (ADA) diabetes "plate" and their recommendation that more

information was needed on the effectiveness of the "plate" method (Evert et al., 2014). In

addition, two social media platforms, the Healthy Diabetes Plate Facebook and Pinterest

pages, were designed and incorporated into the program to determine if they would provide

support and help individuals with their diabetes meal planning skills. The new curriculum was

called The Healthy Diabetes Plate & Social Media (HDP & SM) program.

The new HDP & SM program was taught over an eight week period. Participants

attended face-to-face classes during weeks 1, 3, 5, and 7 and completed Facebook or Pinterest

activities during weeks 2, 4, 6, 8. During the face-to-face classes, participants learned about

the signs and symptoms of diabetes, the updated Healthy Diabetes Plate (Figure 2) which

consisted of five food groups –non starchy vegetables, starches, lean protein, fruit,

milk/yogurt, how to select foods in the supermarket, cooking tips, and eating out. At each

face-to-face class, participants completed meal planning activities. During the social media

sessions (weeks 2, 4, 6 and 8) participants completed Facebook and Pinterest activities that

reinforced the concepts covered in lessons 1, 3, 5, 7, and posted pictures of meals they consumed.

Figure 2: The Updated Healthy Diabetes Plate
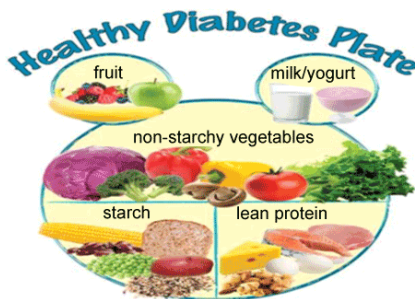
The HDP & SM project was approved by the University of Idaho (UI) Institutional Review Board (IRB) in January 2015. Seven University of the Idaho extension faculty and one Certified Diabetes Educator (in Oregon) were trained on the research protocol and conducted the program in a community or hospital setting from February – June 2015.

PARTICIPANTS

A convenience sample of (N=54) adults enrolled in the study and (N=28) completed the study. They were recruited through the University of Idaho extension offices, diabetes support groups, and health care agencies using flyers, radio advertisements and Facebook. Eligibility criteria included being 18 years of age or older, being diagnosed with type 2 diabetes, having a caregiver or friend with diabetes or interest in diabetes meal planning. Classes were offered for free or at minimal cost. All subjects signed a Subject Consent Form at the first class.

DATA COLLECTION

The HDP & SM program was evaluated using pre- and post- surveys, questionnaires, in-class meal-planning activities, and social media (Facebook and Pinterest) postings. The following types of data were collected:

Demographic and diabetes characteristics: At week 1, participants provided information on age, gender, race and ethnicity, and their diabetes characteristics.

Ability to plan meals: In the four face-to-face classes, participants completed breakfast, lunch, and dinner meal planning "plate" sheets using the five diabetes food groups (Figure 3).

Figure 3: Example of the Healthy Diabetes Plate Meal Planning Sheet at Breakfast
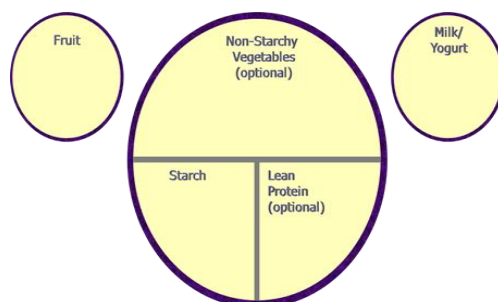
Changes in behaviors: Participants completed a pre-survey in week 1 and post-survey in week 7 that measured changes in eating behaviors, self-efficacy, and social media use.

Changes in diabetes signs, symptoms: Participants completed a diabetes signs and symptoms questionnaire pre- and post-study which measured change in their diabetes signs and symptoms

Facebook and Pinterest: Participants' responses on the HDP Facebook page were organized by themes and analyzed by frequency. For Pinterest, the number of participants were identified that posted recipes to four Pinterest boards; breakfast, lunch, dinner and snacks.

STATISTICAL ANALYSIS

Mixed methods – quantitative and qualitative analyses –were used to analyze the data. Quantitative analyses included frequencies and Pearson's chi-square analyses. Frequencies were conducted on demographics and diabetes characteristics of participants, ability to plan meals and diabetes signs and symptoms. Pearson's chi-square (X^2) analysis was used on questions that had categorical responses which included eating behaviors and self-efficacy; significance was set at an alpha level of ≤0.05. Qualitative data was obtained by analyzing the participant themes from the HDP Facebook and Pinterest pages.

RESULTS

Demographic and Diabetes Characteristics of Participants

Table 1 shows participants' age, sex, race, ethnicity diabetes type, length of time with diabetes and diabetes history. Fifty-five individuals started the project, and 28 (52.7%) completed all four lessons. Most of the participants (82%) were 41 years or older. Ages ranged from 21 to 71 and older. From the 28 participants that completed the lessons, 93 % were female, 96 % were Caucasian and non-Hispanic. Fifty percent of participants had type 2 diabetes, of these, 17.8 % were newly diagnosed (less than one year) and the rest had diabetes from 1-20+ years. The remainders of the participants were either caregivers or friends (14.

3%) and 21.4% didn't have diabetes but were interested in learning about diabetes meal
planning.

Table 1: Demographic information and characteristics of participants in the HDP
& SM program

Characteristics	No. of Participants (%)
Age	
21-30 years-old	1 (3.6)
31-40 years old	3 (10.7)
41-50 years old	3 (10.7)
51-60 years old	6 (21.4)
61-70 years old	10 (35.7)
Greater than 71 years old	4 (14.3)
Sex	
Male	2 (7.1)
Female	26 (92.9)
Race	
White or Caucasian	27 (96.4)
American Indian and Alaska Native	0 (0.0)
Native Hawaiian and Other Pacific Islander	1 (3.6)
Black or African American	(0.0)
Asian American	0 (0.0)

Ethnicity	
Hispanic	1 (3.6)
Non-Hispanic	27 (96.4)
Diabetes History	
Type 1 Diabetes	1 (3.6)
Type 2 Diabetes	14 (50.0)
Gestational Diabetes	0 (0.0)
Not sure if they have diabetes	3 (10.7)
Caregiver or a friend of someone who has diabetes	4 (14.3)
Don't have diabetes but are interested in diabetes meal planning	6 (21.4)
Length of time with diabetes	
Newly diagnosed, less than 1 year	5 (17.8)
1-5 years	2 (7.1)
6-10 years	2 (7.1)
11-15 years	1 (3.6)
16-20 years	2 (7.1)
Greater than 20 years	3 (10.7)
Doesn't Apply	10 (35.7)

Ability to Plan Meals

In lessons 1, 2 and 3, participants completed a Healthy Diabetes Plate meal planning activity that measured their ability to correctly plan meals in three settings – home, grocery store, and eating out. For each setting, the percentage of correct responses for each of the five food groups was calculated. There was an increase in participants' knowledge or ability to plan meals from lesson 1 (79%) to lesson 2 (92%) and this knowledge was maintained in lesson 3 (93%). In lesson 1, the percentage of correct responses for the five food groups ranged from approximately 70% (for milk/yogurt, non-starchy vegetables, starch) to 80% (lean protein) and to 91% (fruit). In lesson 2 and 3, for each of the five food groups, approximately 90% of the responses were correct.

Table 2: Percentage of Correct Responses on Food Choices, by Food Group and Meal Setting

	Meal Setting		
Food Group	Lesson 1: Home	Lesson 2: Grocery Store	Lesson 3: Eating Out
Fruit	91%	100%	100%
Milk/Yogurt	72%	79%	91%
Non-starchy Vegetables	73%	92%	80%
Starch	74%	93%	93%
Lean Protein	83%	92%	97%
Total Correct	79%	92%	93%

Changes in Behavior

Table 3 shows the percentage of participants' pre- and post-test responses on questions covering eating behaviors and self-efficacy. With an alpha level set at (≤ 0.05) questions 1, 4 and 5 were statistically significant and showed an improvement in scores from pre- to post-test. Question 1 asked participants how difficult it was to following their diabetes meal plan. It was difficult to interpret this result since 43% of the participants initially did not answer this question. This may have been due to not using a diabetes meal planning tool before the study began. Generally, from pre- to post-, there was a decrease in the number of people who found their diabetes meal planning tool to be difficult and an increase in the number who found it to be easy, which may explain why this was significant ($p<0.03$). For question 4 there was a significant improvement ($p<.044$) in the number of people that reported being somewhat confident in their ability to eat out at restaurants and following their diabetes meal plan, from 32% to 47%. For question 5 there was a significant ($p<0.03$) improvement in the number of people that reported being very confident in their ability to follow a diabetes meal plan, from 21% to 36% and somewhat confident, from 29% to 50 %. Questions 2, 3 and 6 showed an improvement in scores as well, but were not statistically significant. There was no significant change in the number of meals or snacks that they ate or in their level of confidence in preparing recipes and following their diabetes meal plan.

Table 3: Changes in Eating Behaviors and Self-efficacy

Question on diabetes eating behaviors (Q1-3) and self-efficacy (Q4-Q6)	Pre-test response # and Percentage (%)	Post-test response # and Percentage (%)	Chi square observed P value
1. How difficult is it to use your diabetes meal planning tool?[a]	Response #: 0 (43%) 1 (7%) 2 (11%) 3 (14%) 4 (21%) 5 (4%)	Response #: 0 (7%) 1 (4%) 2 (11%) 3 (21%) 4 (9%) 5 (14%)	11.6 0.031
2. How many meals do you eat regularly?[b] Breakfast = 1 Lunch = 2 Dinner = 3	0 (14%) 1 (11%) 2 (25%) 3 (50%)	0 (4%) 1 (4%) 2 (32%) 3 (61%)	3.34 0.366
3 How many snacks do you eat each day?[c]	0 (25%) 1 (18%) 2 (39%) 3 (14%) 4 (4%)	0 (4%) 1 (14%) 2 (61%) 3 (21%) 4 (0%)	7.29 0.103
4 How confident are you in your ability to eat out at restaurants and follow your diabetes meal plan? [d]	0 (21%) 1 (18%) 2 (32%) 3 (7%) 4 (18% 5 (4%)	0 (0%) 1 (11%) 2 (57%) 3 (18%) 4 (7%) 5 (0%)	11.36 0.044
5 How confident are you in your ability to shop for groceries and follow your diabetes meal plan? [d]	0 (21%) 1 (21%) 2 (29%) 3 (14%) 4 (14%) 5 (0%)	0 (0%) 1 (36%) 2 (50%) 3 (7%) 4 (4%) 5 (4%)	12.1 0.033
6 How confident are you in your ability to prepare recipes and follow your diabetes meal plan? [d]	0 (21%) 1 (18%) 2 (43%) 3 (14%) 4 (0%) 5 (36%)	0 (0%) 1 (39%) 2 (36%) 3 (18%) 4 (4%) 5 (4%)	9.54 0.065

[a] = choices include: 1= very difficult, 2 = somewhat difficult, 3= neither difficult not easy, 4= somewhat easy, 5 = very easy

[b] = shows how frequently breakfast, lunch, dinner is consumed

[c] = choices include: 1 = one snack, 2 = two snacks, 3 = three snacks, 4 = more than three snacks

[d] = choices include: very confident, 2 = somewhat confident, 3 = neither confident nor unconfident, 4 = somewhat confident, 5 = very unconfident

0= responses recorded as "0" listed in the table above are the percentage of participants that did not answer the question

Changes in Diabetes Signs and Symptoms

The diabetes signs and symptoms that participants were asked to report at week 1 (pre) and week 7 (post) include increased appetite, weight loss, fatigue, increased urination, increased thirst, and blurry vision. Although participants experienced no significant changes in the aforementioned symptoms from pre-to post-, there was a positive trend towards improvements in appetite, weight loss, fatigue, urination and blurry vision.

Facebook and Pinterest results

From the Facebook and Pinterest activities offered 14 individuals (47.8%) chose not to use SM for diabetes meal planning. For those participants that did use SM, they used it to (1) help in meal planning (56.5%), (2) find recipes (34.8%) and (3) assist when dining out (26.1 %).

Social Media

When considering the amount of participants that began the class (N=54), few (21 total responses) chose to participate in Facebook and Pinterest activities which included

questions and activities related to each lesson. For those who did participate, common themes on the Facebook page were identified and related to preparing meals at home (57.1%), followed by diabetes management (19.0%), supermarket activities (14.3%), and signs and symptoms of diabetes (4.8%). Participation in the Pinterest activity was also low where fourteen chose to post a recipe or a modified one that fit the HDP. However, Pinterest was a positive venue for posting recipes, with 67 breakfasts, 51 lunches, 22 dinners and 1 snack recipe posted.

Discussion

The three components of diabetes self-management are diet (i.e. following a healthful eating pattern), regular physical activity, and often medications (Evert et al., 2014). The eight week Healthy Diabetes Plate (HDP) and Social Media(SM) program focused on diet, the most challenging component of diabetes self-management (Evert et al., 2014). Overall, it was successful in teaching participants how to plan meals and increase their level of self-efficacy. It was less successful in keeping participants enrolled in the program and having them use social media (Facebook and Pinterest). Although they weren't statistically significant, slight decreases in diabetes signs and symptoms were noted as observed by participants.

The classroom and social media components taught participants how to plan meals in three settings. Results from the classroom meal planning activity showed that 79 % to 93 % were able to correctly plan breakfast, lunch, and dinner meals based on foods they had at home, foods in the supermarket, and when eating out in a restaurant. These results were similar to other researchers (Raidl et al., 2007) that used the plate method for diabetes meal planning activities. Being able to plan meals in a variety of settings indicates that the HDP

program is flexible which meets the American Diabetes Association recommendation that diabetes meal plans should not be "one size fits all (Browns-Riggs, 2014)".

The social media component of the Healthy Diabetes Plate program was designed to reinforce principles covered in the classes. Fifty percent of subjects participated in the social media activities. This low participation rate may be due to the majority of participants being 51 years or older (51%) and most of them not using social media. This corresponds to statistics gathered by the Pew Research Center which found that approximately 46% of Internet users 65 years and older use social networking sites (Pew Research Center, 2013). For those who participated in the social media activities, approximately 60% found them useful and used Facebook and Pinterest mainly to post pictures of HDP meals and share recipes which may have helped them in their classroom meal planning activities.

There was an improvement in participants' self-efficacy or level of confidence in their ability to eat out at restaurants, shop for groceries and prepare recipes while still following their diabetes meal plan level. Higher self-efficacy has been found to improve diabetes self-management behaviors in diet, exercise, blood sugar testing, and taking medication (AL-Khawaldeh, Al-Hassan & Froelicher, 2012, Mishali, Omer & Heymann, 2010).There were no significant changes in participants' diabetes signs and symptoms.

Limitations

There were several limitations of this study. The first limitation was the composition of the sample. It was small (n=28), a convenience sample, and most of the participants were female and Caucasian. Therefore, it may have not been representative of the type 2 diabetes population and the results may not generalize to them. A second limitation was that attrition

rate was high (48%), where several people didn't finish the ending lessons A third limitation was low participation in the social media component of the project. Finally, we didn't look at the long-term effectiveness of the project.

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APPENDIX 1

I.   Pre and Post Survey

Demographic information (Pre-survey only)

1. How old are you? (add age groups)
    a. 21-30 years-old
    b. 31-40 years-old
    c. 41-50 years-old
    d. 51-60 years-old
    e. 61-70 years-old
    f. Greater than 71 years-old

2. Are you
    a. Male
    b. Female

3. Which type of diabetes do you have? (check all that apply)
    a. Type 1
    b. Type 2
    c. Pre-diabetes
    d. Gestational diabetes
    e. Not sure if I have diabetes
    f. Care giver or a friend of someone who has diabetes
    g. Don't have diabetes but am interested in learning about diabetes meal planning
    h. Other (write in):_____

4. How long have you had diabetes?
    a. Newly diagnosed, less than 1 year
    b. 1-5 years
    c. 6-10 years
    d. 11-15 years
    e. 16-20 years
    f. Greater than 20 years
    g. Does not apply

5. Please check race category (check all that apply)
    a. White or Caucasian

b. Black or African American
c. American Indian and Alaska Native
d. Asian
e. Native Hawaiian and Other Pacific Islander

6. Please check ethnicity
    a. Hispanic
    b. Non-Hispanic

Diabetes Meal Planning Information

1. Which diabetes meal planning tool(s) do you use? (check all that apply)
    a. Exchange List
    b. Glycemic Index
    c. Plate Method
    d. Healthy Diabetes Plate
    e. I am not currently using any diabetes meal planning tool
    f. Other: write in_____

2. How difficult is it to use your diabetes meal planning tool to be?
    a. Very difficult
    b. Somewhat difficult
    c. Neither difficult nor easy
    d. Somewhat easy
    e. Very easy

3. Which meal(s) do you eat regularly? Check all that apply.
    a. Breakfast
    b. Lunch
    c. Dinner

4. How many snacks do you eat each day?
    a. One snack
    b. Two snacks
    c. Three snacks
    d. More than three snacks

5. How confident are you in your ability to eat out at restaurants and follow your diabetes meal plan?

   a. Very confident
   b. Somewhat confident
   c. Neither confident nor unconfident
   d. Somewhat unconfident
   e. Very unconfident

6. How confident are you in your ability to shop for groceries and follow your diabetes meal plan?
   a. Very confident
   b. Somewhat confident
   c. Neither confident nor unconfident
   d. Somewhat unconfident
   e. Very unconfident

7. How confident are you in your ability to prepare recipes and follow your diabetes meal plan?
   a. Very confident
   b. Somewhat confident
   c. Neither confident nor unconfident
   d. Somewhat unconfident
   e. Very unconfident

8. How often do you use social media sites (Facebook, Twitter, Pinterest, etc.,) to help you manage your diabetes?
   a. A great deal
   b. A lot
   c. A moderate amount
   d. A little
   e. None at all

Questions added to Post Test:

9. How helpful did you find the social media component of this class to help you manage your diabetes?
   a. A great deal
   b. A lot
   c. A moderate amount
   d. A little
   e. None at all

10. How are you using it (select all that apply)?

a. To assist you when dining out
b. To find recipes
c. To help in meal planning
d. Not using at all
e. Other _____

11. How often do you use social media sites to help you manage your diabetes?
a. Daily
b. A few times a week
c. Once a week
d. Once a month
e. Not using at all

12. Please rank from 1-5 the types of social media you use/prefer to help you manage your diabetes (with 1 being the most and 5 being the least)
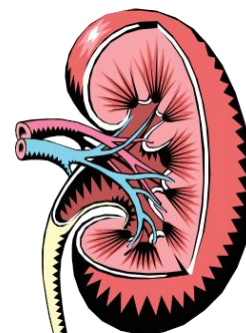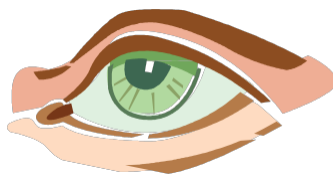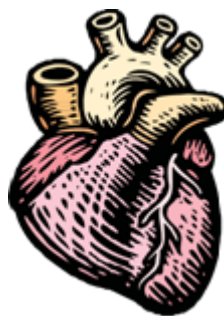
___Facebook
___Twitter
____Pinterest
____Other _____
____Not using at all

II.   Signs and Symptoms Questionnaire
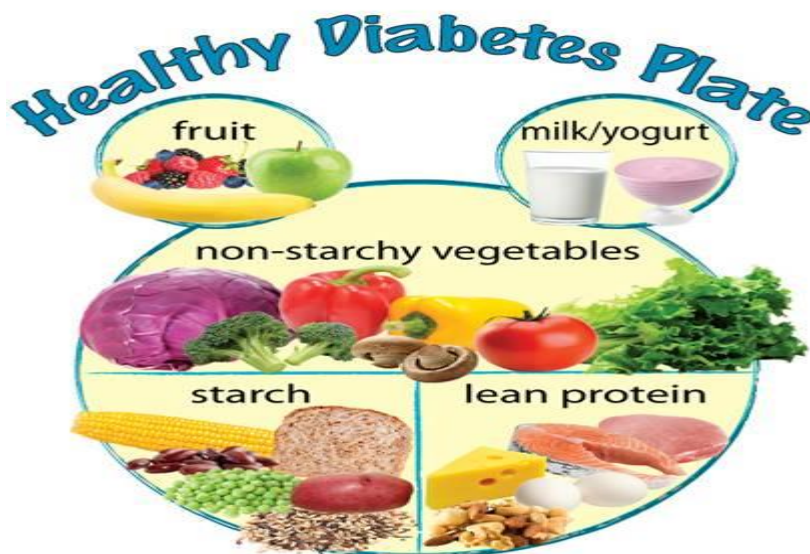
Circle which of the signs and symptoms of diabetes you have or have not experienced.

Increased appetite	Yes	No
Weight loss	Yes	No
Fatigue	Yes	No
Increased urination	Yes	No
Increased thirst	Yes	No
Blurry vision	Yes	No

III.   Meal Planning Sheets: Breakfast and Lunch/Dinner

Healthy Diabetes Plate Meal Planning Handout for Breakfast
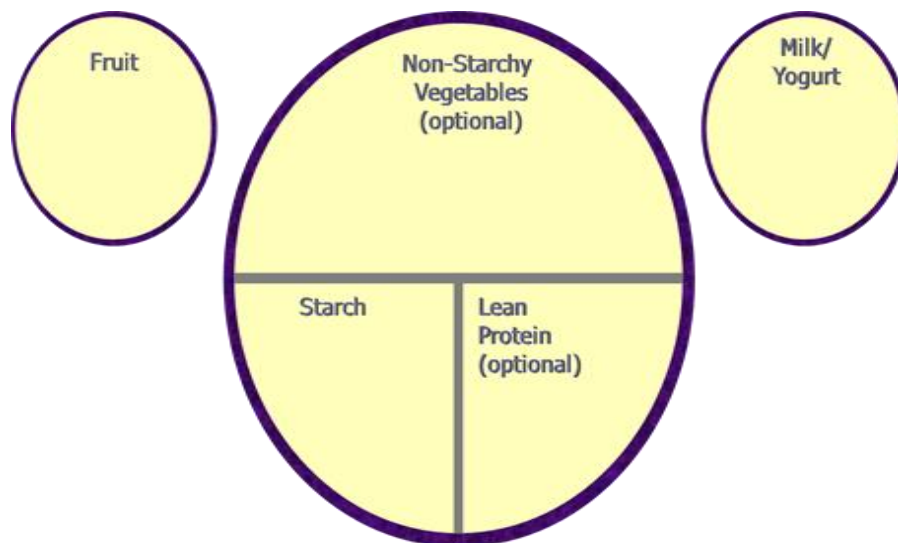
Healthy Diabetes Plate Meal Planning Handout for Lunch/Dinner